SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES

Vol. XX.---No. 4. [NEW SERIES.] NEW YORK JANUARY 23, 1869. $3 per Annum [IN ADVANCE.]

AMERICAN IRON AND STEEL.---PITTSBURGH, THE IRON CITY.

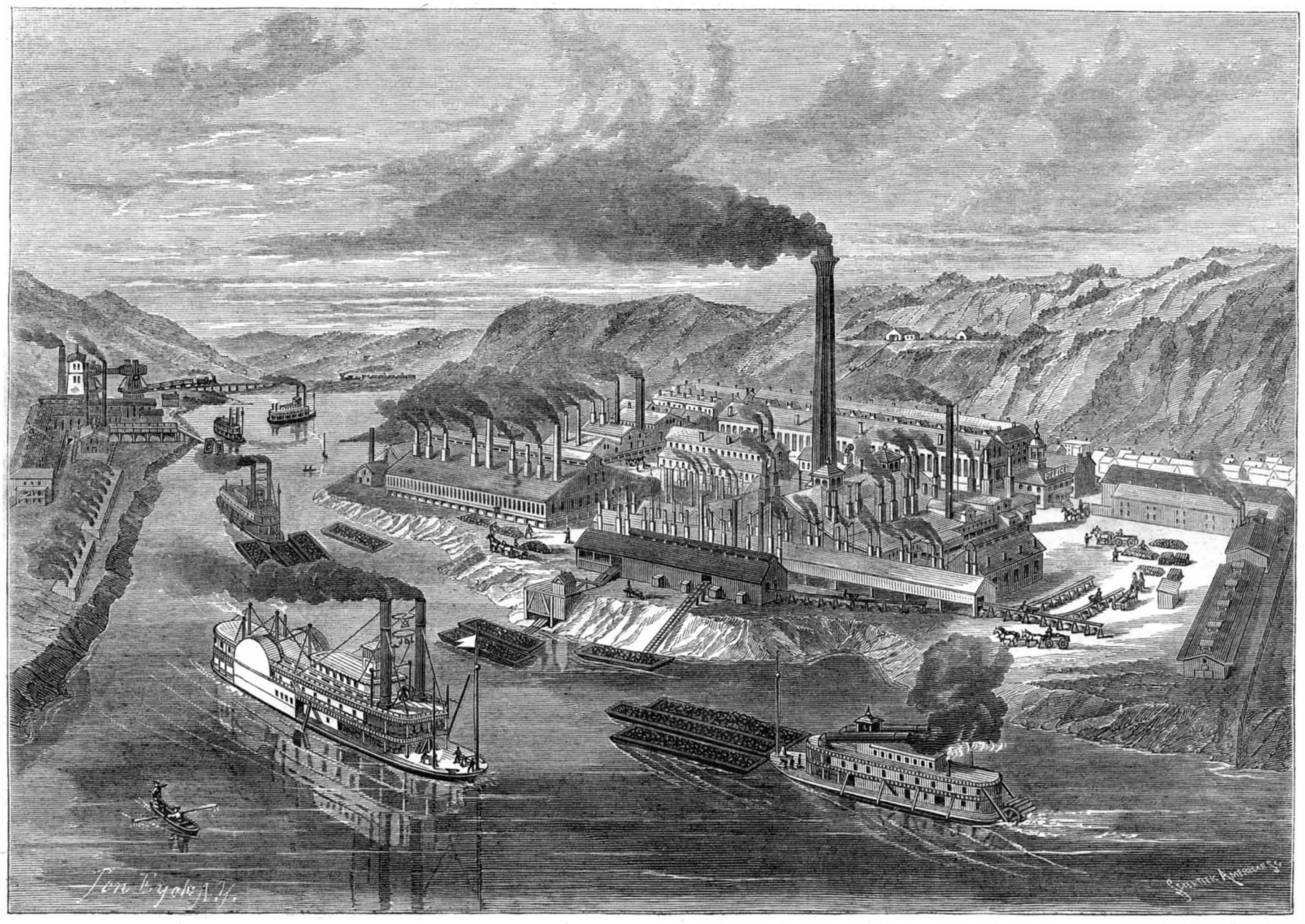
As an example of American enterprise and pluck, as well as of inventive genius, the iron industry of this country is more conspicuous than any other to which our country owes its greatness. Doubtless the agricultural interest of the United States, absorbing as it does the labor of the greatest number and annually yielding a product of much greater money value than any other, deserves to be considered *the* industry *par excellence* of North America; but it is an occupation to which men without capital, other than sound health and an average intellect may aspire with almost the assurance of success. Good, cheap, and fertile lands are within the reach of any who desire to occupy them. Home and foreign demand creates a good and steady market for all agricultural products. These facts coupled with—until recently—almost entire freedom from the taxation which so burdens European farmers, have made the occupation of farming in this country certainly remunerative, and one that could be entered upon by comparatively inexperienced men. The ease with which new lands could be obtained to replace those exhausted by a system of drafts without deposits, has made farming almost solely a process of ploughing, sowing, and reaping, to be discontinued in one locality and repeated in another as soon as the reaping was found to be disproportionately easy. From the nature of the case it required no fostering care from the Government. It could, and it can for a century to come, take care of itself.

With the manufacturing interests of the country the case has been far different. A few are indeed accessible to men of small means, and involving only a comparatively small amount of skilled labor, may be considered as exceptions to the general rule. Of these the manufacture of lumber is a notable example. But manufacturing in general requires large capital, of both money and brains, in its conduct, and skilled, and therefore in this country expensive labor in its performance. Skilled labor will remain expensive labor in the United States so long as farmers can afford to pay for green hands, more than skilled laborers can get in Europe, and "glad to get them at that," thus preventing any glut of the labor market. We are glad to be able to say to-day, that notwithstanding the tide of immigration which is constantly setting toward our shores, there is no prospect of a glut of labor.

But this state of things while it exhibits the vitality of the Government, and the extent of our National resources, is at present—as it has been in the past—a source of great and unnecessary embarrassment to the manufacturing interests of the country. It has impoverished proprietors, and had it not been for the agricultural growth which our unoccupied territory has permitted, it would have ere this reduced the American laborer now happy in the possession of a comfortable home, a family well clothed, housed, fed, and educated, to the condition of the English operative whose only ambition is to stolidly and stupidly perform his daily task, and whose highest idea of enjoyment is, at its close, for a brief hour to smother and drown his feelings of wretchedness in tobacco smoke and beer at a pothouse.

We have said the embarrassments to which American manufacturers have been forced to submit are unnecessary. It will be easy to demonstrate this. They have arisen from competion with the cheap labor of Europe. It has always been in the power of the general Government, to put a stop to such competition, by a protective tariff. In failing to do this, or by only very partially protecting some of her most important industrial interests, the Government has committed a grave but not irreparable blunder, as we may attempt to show in a subsequent article. We have only alluded to this point in the present article because it has an important bearing upon the subject in hand. No American industry of like magnitude has suffered so much from the want of proper protection as the iron manufacture. Should gold return to par to-day and remain there, the production of fine grade irons here would nearly or quite cease, because the labor involved in their manufacture is so large an element of cost, that competition with foreign iron of like grade would be rendered impossible. It is now possible only by reason of the unstable condition of the gold market. The present financial condition of things cannot last always. The time is coming when either by the resumption of specie payment or from other inevitable causes, disaster will take the place of prosperity, and stagnation will reign where now all is life and activity, unless timely precautions are taken.

Let us look briefly at the progress of the iron industry, as illustrated by the operations at Pittsburgh, the Iron City, to which our attention has been specially called by a recent visit. We were once amused by a comic picture of General Grant, as he appeared on the balcony of a Western hotel, in response to a serenade. A pair of military boots surmounted by a cloud of smoke, constituted the portrait. Substitute for the boots the water front on the Monongahela river, crowded with a fleet of grimy coal barges, with a few sternwheel steamboatsscudding about among them, having their smoke pipes thrown back to avoid the bridges, like the ears of a frightened rabbit, and you have an accurate description of the best view of Pittsburgh obtainable during a week's stay at that busy place. The smoke is not so dense however that you cannot walk through it, if your courage, and disregard of soiled linen, are sufficient for the attempt. Plunging in then boldly, and traveling in any direction, you shall not fail to meet with something interesting. Anon through the dense veil of smoke you will hear the thud of a steam hammer; and presently a dim glow which intensifies as you approach, announces the proximity of some large iron or steel works. Or suddenly you chance upon an army of workmen with their long iron tubes, each having a glowing ball at its extremity, which by their dextrous manipulations becomes successively a balloon, a cylinder, a pane of glass, a goblet, or a fruit jar. This is one of the numerous glass works with which the city abounds, and of which mention shall be made in a future number Here is the enormous foundery where the heaviest guns ever made in this country, are cast, by a method with which our readers are already familiar. Passing down Smithfield street and crossing a fine suspension bridge over the Monongahela, you enter what is called Birmingham. Along this side of the river as well as on the Pittsburgh side, is a forest of chimneys which by day and by night vomit forth lurid flames, and smoke so dense that the air is constantly filled with black snowflakes. These get in your eyes, in your



IRON MILLS OF JONES & LAUGHLINS, PITTSBURGH, PA.

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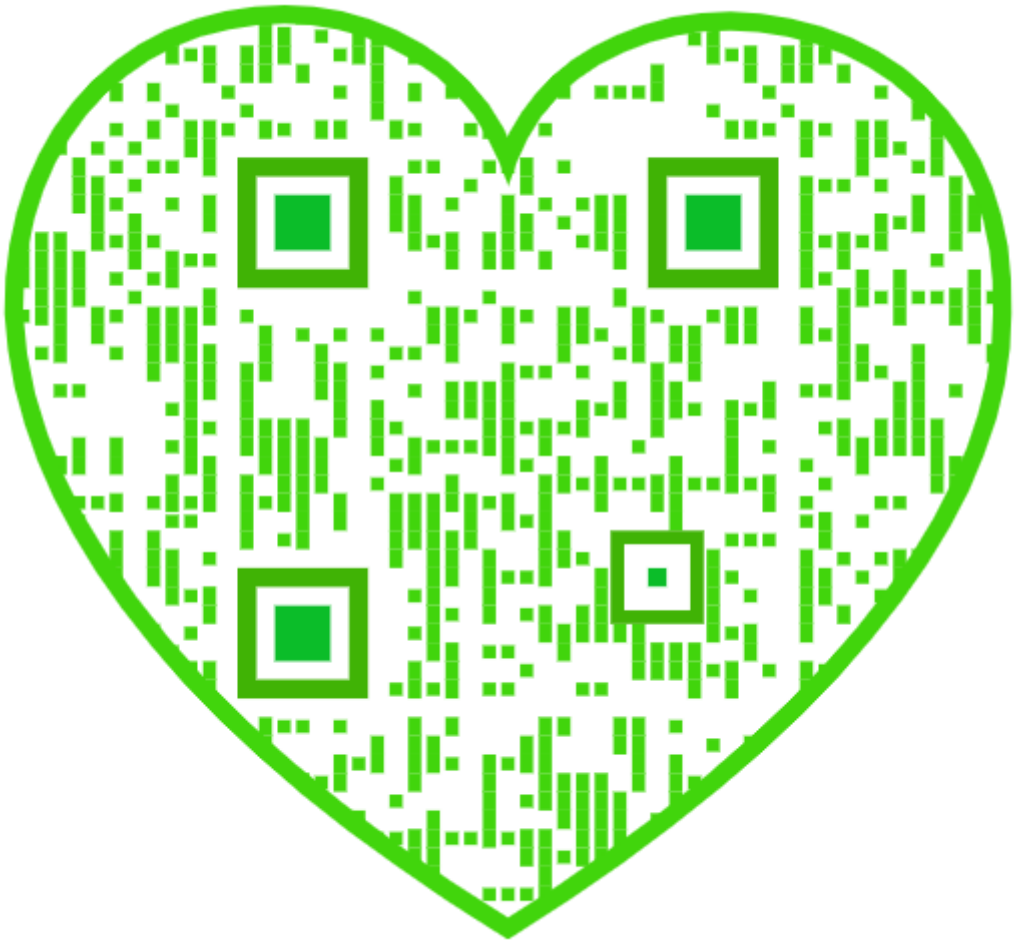

nose, ears, and mouth; and on your shirtfront. Your complexion will shortly be some shades darker, but we promise you reward for all these personal discomforts before we return. Entering a horse car we find the inevitable smut, but we are quickly conveyed to our special destination. Before we get there we will tell you where we are going, and why we are going thither. We are bound for the iron mills of Messrs. Jones and Laughlins, the largest establishment of its kind in the United States.

Stepping from the car we enter the office, and in response to the announcement of our visit a member of the firm promptly and cordially gives us welcome, and offers his escort during our tour of inspection.

First as being something out of the general run, and therefore of greater interest, we are shown into the cold rolling mill and machine shops of the establishment. In this shop is made the celebrated Patent Cold Rolled Shafting, for which this firm is so justly famed. The process of manufacturing this shafting is so peculiar and the results so remarkable, that we are sure our readers will be eager for the details. We must be as brief as possible however, as there is very much more of interest to see and describe.

The iron is first rolled hot—a very fine quality only being employed for the purpose—into round bars exceeding in diameter the required size of the shaft from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch. These bars are next plunged into a warm bath of diluted sulphuric acid to remove the scale. They are removed from this bath and immediately plunged into a hot bath of lime water to neutralize the acid. A third cleansing bath of hot water and a thorough rubbing with pumice stone, prepare the bars for the cold rolling process. The baths are heated with steam in order to facilitate the reactions, and also to impart heat enough to the bars to dry them instantaneously when taken out of the cleansing bath, and thus prevent rusting. The bars are next passed through a train of chilled iron rollers, differing from the ordinary rollers only in their greater size and more perfect construction. During this process the rollers are gradually let down to the diminished size of the bars, the latter being constantly turned about by the workmen so as to be uniformly condensed and formed until they will exactly fit Whitworth's Manchester Standard Gage Rings of the desired size. By this operation the bars are considerably lengthened and a most exquisite finish is imparted to them. So far as we have seen, no lathe finished shafting can compare with them in beauty of finish or uniformity of size throughout the entire length. Shafts selected promiscuously from a stock on hand in the A. B. Taylor Printing Press and Machine Co.'s Works, were tested on one occasion by Dr. Pratt of Providence, at the Fair of the American Institute in New York, and found to vary only by one thousandth of an inch from perfect uniformity. No less surprising is the perfectly rounded form attained by this method. In this respect they are fully equal to the finest turned shafting.

It was currently supposed previous to the introduction of this method, that the quality of the iron would be injured by rolling it cold. In its incipiency the process met with derision and almost universal skepticism and opposition, both from eminent engineers and men who although not eminent as theorists, were entitled to respect from their long practical experience. Messrs. Jones and Laughlins had the sagacity to perceive the seeds of truth in the proposed system, and to their timely aid and indomitable pluck, combined with the persistence rendered possible by large capital, it owes its success.

Our opinions as to the merits of the cold rolling process are sustained by the following tests. In 1860 a large number of specimens were submitted to Maj. Wm. Wade, of the U. S. Ordnance Department, who subjected them to rigid comparative tests with the same quality of iron rolled while hot, of which we give the following summary of average results extracted from his report:

SUMMARY

	IRON ROLLED WHILE		Ratio of increase by Cold Rolling.	Average rate per cent. of increase
	HOT.	COLD.		
TRANSVERSE—Bars supported at both ends, load applied in the middle, distance between the supports, 30 inches. Weight, which gives a permanent set of one-tenth of an inch, viz.: 1¼ in. square bars	3,100	10,700	3,451	162½
Round bars, 2 in. diam.	5,200	11,100	2,134	
Round bars, 2¼ "	6,800	15,600	2,294	
TORSION—Weight, which gives a permanent set of one deg., applied at 25 in. from center of bars				
Round bars, 1¼ in. diameter, and 9 in. between the clamps	750	1,725	2,300	130
COMPRESSION—Weight, which gives a depression, and a permanent set of one-hundredth of an inch, to columns 1½ in. long and ⅝ in. diameter	13,000	34,000	2,615	161½
Weight, which bends, and gives a permanent set, to columns 8 in. long and ⅝ in. diameter, viz.: Puddled iron	21,000	31,000	1476	64
Charcoal bloom iron	20,500	37,000	1,804	
TENSION—Weight per square inch, which caused rods ⅝ in. diam. to stretch and take a permanent set, viz.: Puddled iron	37,250	63,427	1,887	95
Charcoal bloom iron	42,439	87,396	2,059	
Weight per square inch, at which the same rods broke, viz.: Puddled iron	55,760	83,156	1,491	72
Charcoal bloom iron	50,927	99,233	1,950	
HARDNESS—Weight required to produce equal indentations	5,000	7,500	1,500	50

Indentations made by equal weights, in the center, and near the edges of the fresh-cut ends of the bars, were equal; showing that the iron was as hard in the center of the bars as elsewhere.

The following results were obtained by Fairbairn, from whose report the following summaries are extracted:

FIRST SUMMARY

CONDITION OF BAR.	Tensile strength, per sq. inch		Elongat'n of 10 in., in inches.	Ratio of strength, the black bar being taken at 1,000.....
	In lbs.	In tuns.		
Black bar from rolls	60,746	27,119	2.020	1,087
Bar turned down to 1 inch diameter	58,628	26,173	2.000	1,000
Bar rolled cold to 1 inch diameter	88,280	39,388	0.079	1,505

"The first bar was broken in the condition in which it came from the iron manufacturer; the second was a similar bar turned in the lathe; and the third had been subjected to the process of cold rolling.

"It is obvious that the effect of the consolidation in the last case was to increase the strength of the bar in the ratio of 10 to 15.

SECOND SUMMARY

	CONDITION OF BAR.	Breaking w'ht of bar in lbs.	Breaking weight, per sq. inch. In lbs.	Breaking weight, per sq. inch. In tuns.	Strength, the untouch'd bar being unity.
1	Untouched (black)	50,346	58,623	26,173	1,000
3	Rolled cold	69,295	88,230	39,388	1,505
4	Turned	47,710	60,7 6	27,119	1,036

"In the above summary it will be observed that the effect of consolidation by the process of cold rolling, is to increase the tensile powers of resistance from 26·17 tuns per square inch to 39·38, being in the ratio of 1:1·5, one-half increase of strength gained by the new process of cold rolling."

John P. Whipple, Chief Engineer of the U. S. Navy, obtained results fully as favorable in his experiments upon iron plates prepared by the cold rolling process, and one by one the skeptics have been converted to the new faith, and have made profession before the world. But tests of the kind above described would still be insufficient to warrant success unless actual and continued trial could be added. Practical tests will only convince practical men, tests that appeal to the eye of experience. There is no lack of such tests. The shafting has been used by the A. & W. Sprague Manufacturing Co., of Providence, in their various mills, and after using it four years their opinion of its merits is shown by an order of 6,000 feet for their new mill in Augusta, Maine. It has been ordered after a test of six years for the Harmony Mills by Mr. Johnson, their accomplished Superintendent, a man whose judgment in all matters connected with his profession is of the highest character; the U. S. Flax Co., of Central Falls, R. I.; the Great Falls Manufacturing Co., of Great Falls, Mass.; the Chicago, Rock Island, and Pacific R. R., for their new shops at Chicago; the Champion Machine Works, Springfield, Ohio; the Buckeye Mower and Reaper Works, at Akron, Ohio; Government Printing Office and Printing Bureau of the Treasury Department, at Washington, and many others which we forbear to name.

But among the most striking evidences of the superior quality of the cold-rolled iron, is the success it has met with in the manufacture of finger-bars for reapers. It has almost entirely superseded the use of steel for this purpose. Messrs. Jones and Laughlins made this year seventy thousand of these bars, and have already on their books orders for sixty thousand next year, which they are confident will be increased before the close of the year to one hundred thousand. These bars can be depended upon for uniform strength, which is not the case with steel finger bars, and have given so much satisfaction that not a single complaint has ever been made of their giving out, or of any trouble in drilling them. In short a steel cutter-bar is now rarely to be met with in this country.

If the reader will now look at our illustration of the works we are describing, he will see that we have tarried too long at this train of polished rollers, and that in order to glance at the remainder of the works we must economize our time and space to the utmost. Stopping then only long enough to admire the proportions of the 375-horse power engine, which drives these ponderous rollers, and only pausing to note that the tools in the other parts of the shop are of the most perfect construction, from designs made by the able mechanics who superintend the different departments of the works, we move forward. Just as we are leaving the shop the foreman calls our attention to a fly wheel just out of the sand, 10 feet in diameter and weighing 10 tuns, cast in the foundery of the works, and which as an example of accurate molding we have never seen excelled. The extreme variation of the rim from the round does not exceed 1-16 of an inch. The wheel is designed for the main driving wheel in the new nail factory which the firm have now nearly completed, and will be used without turning, the face being ground smooth after it is mounted.

Passing rapidly through the new nail factory, 166 feet by 65 feet, and two stories in height, capable of accommodating from 60 to 100 machines, not yet quite ready for occupation; a blacksmith shop 40 feet by 75 feet containing 8 fires, a 600-pound steam hammer, steam engine, fan, shears, and saw; the foundery 125 feet by 85 feet with an air furnace and two cupolas having a melting capacity of 50 tuns, in which all the machinery for their mills, furnaces, and machine shop are cast; a pattern shop and carpenter shop, 40 feet by 140 feet; we enter next into a building, 130 feet by 280 feet, known as the "New Mill."

Here our attention is immediately arrested by the absence of gearing, the entire mill with the exception of a single train of rollers, being driven by belts alone. The train alluded to is attached to the 18-inch shaft of the ponderous fly wheel of a 600-horse power engine. This fly wheel is 25 feet in diameter and weighs 40 tuns. The face of the rim is 68 inches broad, and carries two immense belts, each 32 inches in width and 140 feet in length, and by them propels the main line of shafting. Although all the usual work is going on in the mill, we find that we can converse without effort. A question as to the practical economy of the belts elicits the fact that, while the firm have another mill of nearly equal capacity driven by gearing, which getting out of order frequently causes annoyance and delay, this mill although it has been running for five years, has never lost a belt, except one which was destroyed while off the pulley, by the carelessness of an employé. The boldness, originality and disregard of precedent shown by the firm in their developement of the cold rolling process, is very prominently shown in the outfit of this shop. We were told that everyone who saw the plans before its completion predicted its utter failure. "It never had, and it never could be done," "Who ever heard of a rolling mill being driven by belts." The croakers are however effectually silenced; it is a *fait accompli*.

The fly-wheel is made in sixteen segments, bolted together. The arms are dovetailed to the rim, and are keyed to it and the spider with oakum, which has been found superior to any other material, as it remains perfectly firm, and never gives trouble by working loose. The oakum is driven in as in the process of caulking, and as this wheel was too large at the time of its construction to be faced, by turning, an important advantage was gained by the use of the oakum in trueing the segments.

Beside the train of rollers already alluded to, this mill contains two sheet mills, one 12-inch train, and three 8-inch trains, for merchant iron. The building also contains the most improved appliances for shearing sheets, and cutting bar iron into suitable lengths for market, among which is a powerful steam saw attached to the shaft of a rotary engine, which, although it makes somewhat extravagant demands for steam, passes through a bar of iron, as though it were a pine shingle.

We have hitherto been too busy to notice a network of railways, which connect all the shops with each other, and the coal mines of the company, situated back of the works, from which the coal is dug, and run down by means of an inclined plane directly to the furnaces at our feet. These railways are over our heads, and passing back and forth in every direction, are made the means of transporting materials from mill to mill, as well as of bringing coal direct from the mines, the entrance to which is marked by the small building on the side of the mountain, back of the main works, and, from which the railroad can be plainly seen in our engraving, descending to the forest of chimneys below. Notwithstanding these facilities for transportation, and the fact that every pound of ore, coal, and limestone, needed in these works, is brought by rail or river to the company's very furnace doors, some conception may be formed of the magnitude of their business, when we add, that they find it requisite to employ beside these facilities sixty able-bodied horses in the immediate vicinity of their mills.

We pass now to what the company call their "Old Mill," a building 325 feet long by 185 feet in breadth. This contains a bar mill, plate mill, nail mill, and forges. It covers an area of 60,125 feet. Here, also, are the fifty-five puddling and boiling furnaces, from some of which constantly issue glowing and scintillating masses to be successively squeezed, rolled, and manipulated until they are transformed into long, lithe, and flaming tongues, which shoot out at you from the rollers in impotent spite. Most of our readers are posted on the subject of iron manufacture. Possibly, some of them may never have had an opportunity of witnessing it. To them, we say, never miss the opportunity when it offers. There is nothing in the whole range of industry which affords a scene of such weird fascination.

Out of this and into a storehouse 375 feet long by 30 feet wide, containing clay for fire bricks, and other materials, and an inclined railway running down to the river, plainly shown in the sketch, to receive and transport pig metal, ore, and other materials to and from the barges at the landing. Thence into an annealing house 60 by 20 feet, for sheet iron, where the sheets are annealed by inclosing them in boxes of cast iron, made air-tight by luting to prevent oxidization, subjecting them to a nearly white heat for from twenty-four to thirty-six hours, and allowing them to cool gradually. Each box and its charge weighs about fifteen tuns. From thence, into a carpenter's shop and pattern rooms, 40 by 140 feet, with the usual appliances. From thence to the large and commodious stable for the accommodation of the sixty horses above alluded to, provided with a steam-engine and mill to grind their fodder. From thence to the spike and bolt factory, 50 by 125 feet, containing, four railroad spike, two ship spike, and two bolt machines, which together with other appliances situated in other parts of the works, for making fish bars and bolts, are capable of turning out daily 2,500 complete joints. From thence to the nail factory, where stand the grim little monsters, which can eat more iron without injury to their digestion than any other machines of their size in existence.

We now suppose our tour concluded, and thanking our polite conductor for his attention, we are surprised by a request to accompany him to the remainder of the works on the opposite side of the river. The "remainder" proves to be a number of blast furnaces, in themselves, quite a respectable establishment, as the reader can see by referring to the engraving where they are shown at the top of the picture; the Monongahela with its never remitting burden of coal barges floating serenely on between them and the principal works, to shortly mingle its muddy waters with the limpid waves of the Allegheny.

Turning to look back as we crossed the bridge on our return, the lurid fires along the opposite bank of the river belching forth from the chimneys, now hidden in the gray dusk of evening, and lighting up the volumes of dense smoke, illuminated them with tints of blood red, purple, pinkish, and reddish grays, of the richest and most brilliant character. The lights reflected in the water below and broken up by the swells caused by the passing boats, combined to produced a scene of variable and indescribable beauty.

The works of Messrs. Jones and Laughlins cover seventeen acres of ground, and give employment to 2,500 hands. They contain twenty-five engines, aggregating 2,750-horse powers, and their capacity is one hundred and twenty-five tuns per day. The steam for these engines is generated in thirty double-flue boilers, the waste heat from the furnaces being largely utilized for that purpose. They are a good example of the rapid growth of American manufactures, when circumstances do not oblige them to compete with European labor; and as a representative of the numerous similar, though smaller works in and around Pittsburgh, they are the best that could be selected. Their specialty, the cold rolled iron, is an example of remarkable success achieved against the ruling of all precedent. Although for a given weight its cost is somewhat greater than the more common turned shafting, its su-

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perior strength permits the use of lighter lines, while its greater rigidity admits a less number of hangers, and, consequently, less friction and less current expense for lubrication. These advantages will be found to more than counterbalance the increased cost per tun of this shafting. For piston rods it is unequaled by any other material, and is rapidly coming into general use for that purpose. It is completely fitted out with improved patent coupling and hangers, fully described and illustrated on page, 305 Vol. XVII. of the SCIENTIFIC AMERICAN. Our space forbids us to attempt at this time, further description of the industries of the "Iron City." We shall at a future time refer to some of them again. Ere we close this article, we wish to give expression to the hope that our Government will soon see the wisdom of protecting its iron interests, thereby securing to it permanent and uniform prosperity, rather than a fitful and spasmodic progress, the result of a vacillating and indefinite policy which enriches speculators by the destruction of legitimate and healthy business, and the depression of honest toil.

THE AFRICAN INTERIOR.

LECTURE BY P. B. DU CHAILLU.

The tenth and concluding lecture of the Parker Fraternity course was delivered lately in the Music Hall, Boston, by P. B. Du Chaillu, the celebrated African explorer. Prof. Du Chaillu related the story of his explorations in the interior of Africa to the large audience in attendance in a very easy and entertaining manner, and held the closest attention of his hearers throughout the entire lecture. His adventures with the natives and gorillas were told with a dry humor, which frequently created a hearty laugh, and the slight foreign accent of the speaker, though it made some of the proper names unintelligible, added not a little to the pleasure of those who listened to his words.

Until within a few years, he said, there was an immense tract of country in Africa, extending from the west coast far into the interior, which had never been explored. Livingstone and other travelers had made extensive explorations in the eastern portion of that country, but of the western portion little was known. For the purpose of learning something of it and its inhabitants, while he was yet only nineteen years old, he started from New York in a schooner with that aim in view, and remained in Africa four and a half years. His explorations demonstrated the fact that the interior of Africa is an immense forest, which, it is estimated, is 1,800 miles in length and about 700 miles in breadth. Some of the trees are of gigantic size, being from two to three hundred feet high, and from twenty to twenty-five feet in diameter. Under these tall trees other trees grow, and beneath these again there is an immense jungle, which, in many places, it is almost impossible for man to penetrate. In many places he and his followers were obliged to follow in the paths made by the elephants in going from one village to another. It rains very much in the interior, and it is estimated that 300 inches of rain fall in a year's time. The heat during the months of March and April, which are the hottest months, was tremendous, the thermometer indicating 149¾ degrees; and in July and August, when the coldest weather was experienced, the mercury fell to 70 degrees. The nights are warm, averaging from 85 to 90 degrees during the rainy season, which begins in September and ends in May. In the far interior there is no dry season whatever. As he advanced into the country the land grew higher and higher, and some of the mountains seen were from ten to twelve thousand feet in hight. The inhabitants are scattered, and divided into a great number of tribes, and miles and miles were often traveled without meeting a single human being, hearing the chatter of a monkey, or the singing of a bird; nothing broke the silence of the grandest solitude. In his travels he had hunger and starvation always before him, and he did not exaggerate, he said, in stating that during 65 out of the 365 days in a year he was without food. The climate was very unhealthy; the decay of the vegetation in the forest caused him to have fever after fever, but he had a stout heart, and kept on as best he could. There are no beasts of burden found in the interior, the work is all done by the women, while the men sit around at their ease and smoke. Neither are the wild beasts of the north and south of Africa to be found here; everything he discovered was new—beasts, birds, and insects were unlike any that had been seen before. He discovered thirty-three new tribes of men; north of the equator there were gorillas, and south of the equator dwarfs from 3 feet 8 inches to 4 feet 6 inches in hight.

After speaking thus in a general way of the country, the lecturer related his personal adventures among the different tribes with which he was brought in contact, beginning with his arrival on the west coast.

Polygamy, slavery, and witchcraft he found were the three great institutions of the country; the more wives a man has the better off he is, and the older a man becomes the more wives he wants, and the younger he wants them to be. The tribes are divided into clans, the clans into families, and each head of a family is chief of a village. The first king he met gave him three of his sons to accompany him on his travels; they went with him to the next tribe, about eighty miles in the interior, the king of which wanted him to remain with his tribe permanently. As an inducement to stay he brought out over eight hundred of his prettiest women and girls for the visitor to choose a wife from. Professor Du Chaillu gave as an excuse to escape from this that if he took one the others would be jealous. The elders of the tribe consulted about his answer, finally agreed he was right, and told him to take the whole of them. This frightened him, and he had to make a tremendous speech to get out of it. The king also gave him three sons, and a large number of followers, men and women, and he continued his travels into the interior. After going up a river about two hundred miles he took to the land, and his difficulties increased in number and extent. In the next village he entered he found every man in it drunk. They have four or five kinds of intoxicating liquors; they get tipsy on palm wine, on a drink made of wild honey and water, also a drink made of bananas and water; and the juice of the sugar cane fermented. The inhabitants of the village had never seen a white man before, and there was great excitement when he arrived. It was near the village that he first saw a gorilla; two were seen together, but they were females, and fled at his approach.

After traveling as far as the the third range of mountains he encountered a very warlike tribe called the Fans. The men dress in the skins of wild animals, and are very powerful; they are cannibals, and have their teeth sharpened to a point. They also were much surprised at seeing a white man; they thought his boots were his feet, and did not know how to account for feet being black and his face white. All about the village poles were stuck up, on the tops of which were the skulls of those who had been captured in battle, and whose bodies had been eaten. The village was laid out with one great street only; that, and the houses, which were made of the barks of trees, were kept quite clean. In three days after his arrival he was allowed to see the king, to whom he made numerous presents, among which was a looking-glass, which caused great excitement when first seen by the natives. He came very near getting into trouble with this people by refusing to eat some food prepared by the king's wife; he was afraid to eat it, he said, for he didn't know that a man's head had not been boiled in that very pot, and he thought he would not relish the gravy at all. By giving the woman some beads, however, he succeeded in averting the danger which threatened. The Fans were the most intelligent negroes he met; they were very good iron workers, and their war weapons were very formidable. But he found among them the worst form of cannibalism. They are not allowed to eat the members of their own families, but they give the corpse to another family, which assures them that it will return the compliment when any of its members die. His encounter with the first male gorilla he saw, was well described by the speaker, and also several subsequent encounters.

The professor exhibited several pictures of the gorilla to the audience, and gave a full description of the animal, pointing out the resemblance between it and man, and also the qualities in which they differ. On returning to America he brought with him, he said, more than one thousand stuffed quadrupeds, twenty-one gorillas, and no end of birds and insects.

Valuable National Statistics.

We have before us the Report of the Special Commissioner of Revenue, Hon. David A. Wells, which is thoroughly characteristic of the fidelity and ability of its author. From the mass of valuable matter it contains we extract the following interesting items:

"From July 1, 1865, to Dec. 1, 1868, 1,000,000 natives of foreign countries have sought a permanent home in the United States. The specie they brought with them is set down at $80 per head, or $80,000,000 in all; while their value to the country, as producers, is estimated at $500 per head, or $500,000,000 in all; making a grand total of $580,000,000 which has been added from this source to the wealth of the country.

The increase of cotton manufactures has been, since 1865, 32 per cent, and the amount of capital invested in the woolen manufacture is more than three-fold now what it was in 1860.

The production of pig iron for 1868 was $1,550,000 tuns, showing a steady annual increase since 1863 of about 8 per cent.

The export of petroleum for 1868 was 95,000,000 gallons.

The amount of anthracite coal mined in 1868 was 13,500,000 tuns.

The crop of Indian corn was, in 1859, 830,000,000 bushels; in 1868, 1,100,000,000 bushels.

The cotton crop for 1868–9 is estimated at 2,780,000 bales.

The tobacco crop for 1867 was 250,000,000 pounds.

Two thousand five hundred miles of new railroad were built in the United States in 1868, making the number of miles now in existence in the country over 40,000. The total value of merchandise annually carried over these roads is $7,273,000,000. Six thousand miles of new telegraph wires have been put up during the past year.

Nearly all the individual States materially reduced their debts in 1868.

From these and similar facts, the Commissioner concludes that our national wealth as a whole is increasing. He reckons, however, a number of influences adverse to our real prosperity. He goes into elaborate calculations to show that while the cost of living has increased, since 1860, 78 per cent, wages have increased only from 50 to 70 per cent. As an illustration of the general principle, he shows that the wages, which, in 1860, would purchase a barrel and a half of flour, now purchases only a barrel and a quarter. Hence, the laboring population are really not as well off as they were.

In regard to the customs, duties, and internal revenue taxes, the Commissioner favors a greater simplification, and a reduction in the number of taxes imposed. He mentions a number of articles, such as salt, lumber, iron, and coal, on which the taxes and duties should be made as light as possible, in order to favor the industry of the country.

Of the national finances the Commissioner speaks at some length, and gives figures to show that with proper economy our national debt can be reduced by $100,000,000 before the close of the next fiscal year, June 30, 1870.

In regard to the tariff, he advocates the imposition of duties with a view to income only, and severely condemns the protectionist policy, which has so many advocates, as exceedingly detrimental to American industry. He concludes by saying:

With these feelings and convictions he would therefore prove untrue to his trust did he not here enter his most earnest protest against any further general increase of the tariff, but would on the contrary recommend

1. An enlargement of the free list.
2. A reduction of some rates of duty, and as an exception an increase of a few others with a view to the increase of the revenue.
3. A reduction of some rates of duty with a view to an absolute abatement, on the simple ground that the reduction of a duty is the reduction of a tax, and that the most efficient method of protecting home industry is by the removal of obstacles in the form of taxes.
4. The conversion to the utmost possible extent of the present *ad valorem* duties into specifics, as the only practicable method of insuring certainty and equality in the assessment of duties and the prevention of undervaluations, and the abrogation of the privilege which enables returning tourists to import free of duty an amount of goods corresponding to their real or supposed social position.

NEWS FOR MECHANICS.

A daily cotemporary informs us that "a method recently suggested for increasing the strength of metal tubes subjected to great expansive forces, as cannon, cylinders of hydraulic presses, etc., consists in heating the cylinder and coating it with a layer of copper and tin, or of pure tin. By means of a machine, strong iron or steel wire, previously coated with the same substance, is wound around the cylinder in a continuous spiral, the turns in close contact, and several layers being made one above the other, the cylinder being kept hot all the time, so that the wire remains in a flexible condition. Iron rings may be placed outside the spiral wrappings, and an extraordinary degree of strength imparted, so as almost to obviate the usual dangers consequent upon bursting."

Most workers in iron would prefer a course diametrically opposite to that indicated in the paragraph above quoted. We do not refer to the efficiency of "copper and tin" or "pure tin" as a strengthener to iron cylinders, but to the method of overlaying the cylinder of iron with layers of "iron or steel wire previously coated with the same substance," that is, copper or tin or their amalgams. In regard, however, to the first statement it might be asked why, if a coating of tin or a composition of tin and copper possesses such remarkable strengthening properties when applied to the outside of iron cannons, and such resisting properties to expansive force, guns and the cylinders of hydraulic presses are not composed wholly of them.

But the heating of the iron cylinder while being covered with successive layers of wire will strike those who have ever strengthened either iron or wood by a hoop shrunk on as, at least, a novel idea.

Winter Railroad Building in Minnesota.

A correspondent of the St. Paul *Press* gives the following account of the progress of the St. Paul and Pacific Railway:

About the end of summer, and after the road was completed to Crow River, the Pacific Company let the contract for grading, bridging, etc., of their road through the remaining portion of the "Big Woods"—thirty-five miles—to Colonel A. DeGraff. Arriving at Crow River, I met the construction train, which soon landed me ten miles west of the Crow River station. The work on this section shows that it "cost money" to clear and grade the track; and, also, considering the miserable rainy weather which has prevailed most of the time since commencing it, the fact is clearly demonstrated that the company, contractors, and all concerned, deserve great credit for their driving energy.

The Pacific folks do not intend to stop work during the winter. De Graff is driving ahead on the grading and bridging. He has hands employed on every section clear through to the prairie, now twenty-four miles from the head of the track. Cutting through these immense hills renders this about the most costly work on any road in the State; but this "heavy work," protected as it is by the thick growth of timber from the winds and storms of the prairie region, enables all hands to do their labor without suffering.

The bridging and track laying follow directly upon the heels of the completed grading. The last bolt is scarcely driven in the superstructure of a bridge before the sturdy strokes of track layers are heard driving home the spikes.

Some estimate of the cost of building this road through the woods may be arrived at by the fact that on the next mile to be finished there are five bridges—one of them five hundred feet long, requiring in their construction one million feet of timber and lumber. The timbers are framed at Minneapolis and St. Anthony, and taken to their station as needed.

Photographic Relief Engraving.

A method of producing an engraving in relief for printing with the common press is described in a recent London journal. The process consists in taking a perfectly clean and well polished plate of copper, and blackening it by application of a solution of sulphuret of potassium, or sulphuret of ammonium, and afterwards washing and drying it. The surface is then coated to a depth of about one-thirtieth (1-30) of an inch with a mixture of resin, wax, and white lead, which, when dry, is carefully leveled and smoothed off. The surface is then sensitized, and a photograph made of the figure to be reproduced. The dark lines or points are then to be taken out with an etching tool down to the blackened copper, until the entire pattern is seen in black on a white ground. The surface is then coated with finely pulverized plumbago, and the excess brushed off, after which the plate is suspended in an acidulated solution of sulphate of copper, connected with a battery, and metallic copper of suitable thickness is deposited on the engraved pattern. Should the engraving be very open anywhere, the resinous coating is thickened by applying melted wax with a fine brush, with the usual precautions.

When the deposit is sufficiently thick, the wax layer is melted off, and the electrotype laid on a plane surface, and backed up by fusible type metal, which is smoothed off by a stereotype plane, and then mounted in the usual manner on wood, so as to be of type hight.

THERE is no element of machinery that has not its counter type in the structure of plants and animals.

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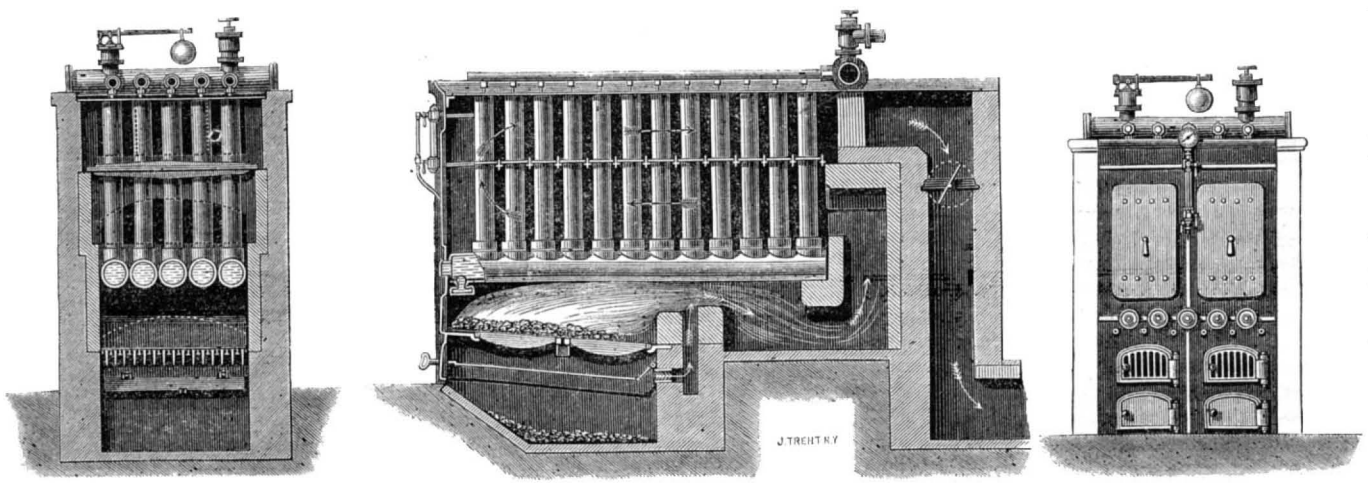
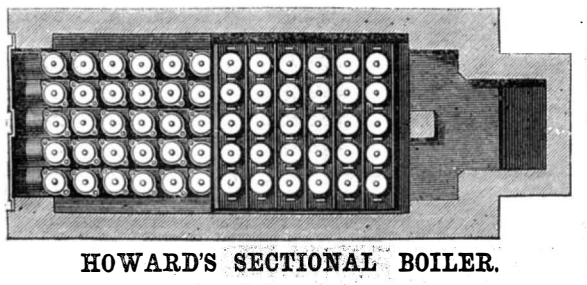
Improved Sectional Boiler.

So numerous are boiler explosions, and so terrible are their effects, that we are coming to regard them with the same dread that is inspired by earthquakes in countries where they are frequent. Thousands of valuable lives in innumerable manufacturing establishments are constantly exposed to the dangers of these explosions. Our public streets are by no means safe from this danger. Few in the crowds thronging the thoroughfares of large cities are conscious of the number of volcanoes in the form of steam boilers that underlie the sidewalks over which they pass. So imminent are these dangers that whoever shall effectually guard against them may fairly claim that he has done the world a service.

The design of Howard's sectional boiler, illustrated in the accompanying engravings—which has been successfully introduced and extensively used in England during the last three years—is to furnish a steam boiler which shall be perfectly safe from explosion, very economical in fuel, durable, easily transported, simple in all its parts, occupying small space, and in which the circulation of water shall be active and uniform.





HOWARD'S SECTIONAL BOILER.

This boiler is built up of horizontal and vertical tubes, the latter of wrought iron, seven inches, and the former of cast iron, ten inches in diameter, and so connected as not to be strained by any inequalities of expansion. Within each vertical tube is a smaller tube, which causes and directs the circulation of the water, thereby preventing any incrustation, the cause of destruction of so many boilers.

By openings through the feed pipe to the horizontal tubes, closed by removable caps, those tubes are accessible to a scraper for cleaning. Through the doors in the boiler front the soot is easily removed from the outer surfaces of the tubes, and thus by easy methods both the inner and outer surfaces of the boiler are kept clean.

The fire impinges at right angles upon most of the heating surfaces, thus delivering the heat most effectually to the water and steam, and causing the greatest evaporation of water for a given quantity of fuel.

The tubes are proved by the manufacturer separately before placing in the sections. The sections, when completed, are tested with a pressure of 500 pounds to the square inch, but are capable of sustaining a much higher pressure. Yet should one of them give way, no dangerous explosion would ensue, the most to be apprehended would be the discharge of a moderate quantity of water and steam into the fire chamber.

Any tube may be readily removed and another set in its place, rendering repairs easy and inexpensive.

Being made in sections it may be transported by mules or other convenient methods, over difficult roads and to places inaccessible to other boilers. It will pass through ordinary windows or doors, not necessitating any removal of or injury to walls, to place it in position. Three men are sufficient to handle the heaviest parts.

The range of water level being great, any point may be selected in the vertical tubes as the water line, the steam space above which, is subjected to the drying action of the current of heated gases passing to the chimney, and the steam may be dried or superheated to any desirable extent.

The American patents for this boiler were obtained through the Scientific American Patent Agency.

A 30-horse power boiler in daily use may be seen at the works of Morris, Tasker & Co., Philadelphia.

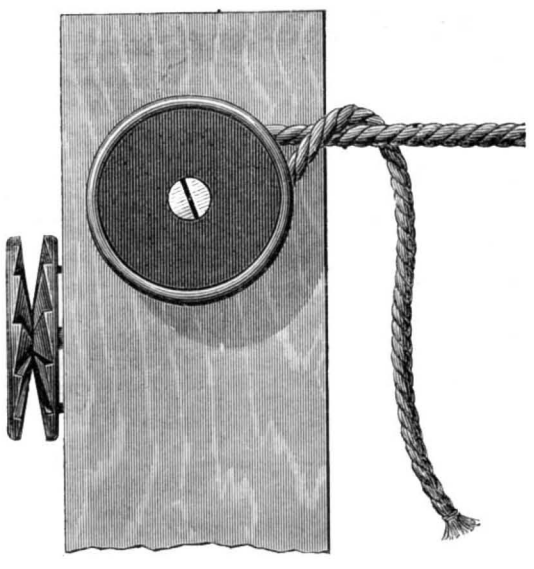
Full models and drawings may be seen, and full information obtained at the office of Austin & Germain, 37 Park Row, New York.

Wanted---A Pipe Light.

The London *Grocer* says: There are several puzzles that have agitated the inventive genius of mankind, from the discovery of perpetual motion down to—what shall we say?—well, pipe lights! That there are some things upon which much patience and skill have been wasted, during years and even centuries, is not remarkable. The philosopher's stone has, perhaps, had its day, but we venture to think, not the pipe light. This stroke of successful genius is in the womb of the future, and its birth will be hailed with immense satisfaction by a large crowd of admiring smokers. The fact is simply this: that no system of pipe-lighting which has hitherto been discovered is really all that can be desired. The qualities necessary to perfection in this apparently trifling article of commerce are portability, cleanliness, safety, easy ignition, freedom from odor, to be unaffected by damp, and capable of being lighted in a gale of wind, if need be. Perhaps there are other essential points, but the foregoing are the main features to be borne in view by the coming inventor. There are shoals of fusees and lights of all sorts already in existence, some exceedingly good and clever in their way, but they have objectionable qualities sufficient to counterbalance any advantages they may possess in other respects. Take the ordinary vesta, for instance. It is neat, portable, and when well made ignites easily; but they cannot be put loose in the pocket, nor can they be used out of doors. On the other hand, the fusee may be lighted out of doors, and will go off like an overcharged firework, to the imminent danger of your eyes and fingers. Indoors its smell is most abominable, or if scented, as some of them are, enough to suffocate a regiment of marines. There is another description of cigar light which attaches itself most pertinaciously to one's clothes, and leaves its mark in the broadcloth in the shape of a small round hole. It would be easy to fill a dozen columns with a description of the merits and demerits of the exceedingly numerous catalogue of candidates for public favor, but there is room yet for the pipe light which shall be unobjectionable and useful in the drawing room, in the railway carriage, on board ship, or when riding on horseback through a thunderstorm.

M'MASTER'S PATENT CLOTHES LINE HOLDER.

The utility, neatness, and simplicity of the device shown in the engraving are too apparent to require any extended explanation. It consists of two cast iron disks secured together and to the post or side of a building by a screw or bolt passing through the center. The one shown on the left exhibits the form of the inner faces, which are radially corrugated or scored, and inclined toward the center. The line is simply passed once around the holder, as seen, and the strain on the line



serves to hold it firmly, the greater the strain the firmer the hold. To release the line all that is necessary is to give a slight pull on the reverse side, when the line is loosened at once. The device may be made of any size to suit any diameter of rope, although one size will suit several sizes of lines. Its cost is trifling, and it can be attached or detached readily, being held by a single screw. It is intended as a support for any portion of the line as well as for securing the ends.

Patented through the Scientific American Patent Agency, Oct. 13, 1868, by D. W. C. McMaster, Southboro, Mass., who will furnish any further information, or orders may be addressed to Bent, Goodnow & Co., Boston, Mass.

Archeological.

The *Pall Mall Gazette* thus describes some interesting relics discovered near Hildesheim, in the old Kingdom of Hanover. "The relics were discovered in some excavations made by a soldier on a piece of land purchased for a shooting ground by the military authorities. A few things were, as usual, abstracted and disposed of in the first moments of surprise, but the colonel of the regiment was soon on the spot to prevent further mischief. At first, it was thought that the objects found belonged to the sixteenth or seventeenth century, and the name of Benvenuto Cellini rose to everybody's lips. Soon, however, an inscription, found at the bottom of a vase, reading L. MALL. BOCCI. PHIL. III., put the inquirers on the scent of a certain Florentine silversmith, Bocci, of whom some fifteenth century writer is said to make mention. But these and similar notions were soon dispelled by Professor Wieseler, the famous archeologist, who at once declared all these treasures to be unquestionably antique. Inscriptions, at present to the number of twenty-four, found on the objects, disposed of the last shadow of a doubt. All the articles are in silver, partly gilt, the reliefs being throughout in raised work. The feet, handles, etc., are in antique fashion, wrought separately, and affixed to the vessels by some tarry substance. Among the more remarkable objects, in the official list are the following: 1. Remnants of a (cast) tripod, its three feet ending in claws, its ornamentation consisting of three hermetic figures of the small-bearded Bacchus. 2. A bill shaped crater about half a meter high, full of the most finished (chiefly erotic) ornamentations. 3–6. Four handsome cups, with inscriptions, having magnificent haut-reliefs inside, representing Minerva, full figure, sitting upon a rock, with ægis and helmet; the owl, and an olive crown at her sides; further, a bust of Kybele, with mural crown and tympans; a Deus Lunus, with a Phrygian star-emblazoned cap, behind him a crescent; a bust of the boy Hercules strangling the two serpents, of rare artistic feeling and truth. 17–20. Three saucepans with ornamented and inscribed handles, 1 lb. 314·6 gr. 38–40. Three bell-shaped cups, with handles and feet. The reliefs upon these are spoken of, both as regards composition and execution, as simply perfect.

The number of the figures representing the masks of Pans, Titans, Satyrs, old and young, male and female, is perfectly astounding. 48. Cup, with feet and handles, on gold ground, with delicate relief in silver, thyrsus staves, fruit garlands, etc., etc. 49–54. Six feet of vessels with inscriptions such as L. MI. BOCHI. PI. XVI., etc., together with a number of minor objects, fragments, etc. The mere value of this *trouvaille*, at the price of old silver is estimated at far above the 3000 thalers which had been the first guess. Everything points to a concealment of this table service in the Augustan age, but the details have yet to be ascertained."

Immense Engines---Pittsburgh Working for St. Louis.

At the Fort Pitt Foundery, in this city, says the Pittsburgh *Evening Chronicle*, the engines, boilers, and castings for the new St. Louis water works are now in process of construction. The work was commenced in June last, and has been pushed on rapidly, but such is the amount of labor to be done, a half year yet may be required to finish the work. The engines are the largest ever made in this city, and it is stated that the bids ranged from $350,000 to $500,000, a number of Eastern firms being among the competitors. Two of the engines are low-surface, and the other two are high-surface, and all are low-pressure engines. By them the water for the city is to be thrown one hundred and fifty-five feet above the level of the river to the main reservoir. The two low surface engines are on what is called the Cornish style, directly connected without beams or fly wheels, and are used to throw the water from the river to the settling reservoir, and from these, the high-surface engines take it up to the distributing reservoir, from which it is distributed through the city. The high-surface engines have beams and fly wheels, and are made after a pattern similar to those used in other water works. Two of the engines are eighty-five inch cylinders, and ten inch stroke, and two are sixty-five inch cylinders and twelve foot stroke. The boilers will be about four hundred horse power. A large amount of heavy castings have been shipped to St. Louis, and the contractors have much more than kept up with the men at work on the reservoirs.

Bad for the Royal Astronomical Society.

The announcement has just been made to the Royal Astronomical Society of England of the discovery, by means of the spectroscope, of a hitherto unknown envelope of gaseous matter surrounding that body, of a thickness of seven or eight thousand miles. Its precise composition has not yet been determined, but will, probably, before long be ascertained. At the same time, Mr. Huggins, who has made so many important discoveries in reference to the composition of the heavenly bodies, by means of the spectroscope, presented a communication, stating that at least one comet contains carbon in a state of ignition.—*Sun.*

We were aware that gas in considerable volume was occasionally given off at meetings of scientific(?) societies, but we had no idea of its amount. A thickness of seven or eight thousand miles, we think, would swamp even the Royal Astronomical Society of England. A halo of twice that thickness, however, could not add to the glory of our scientific societies, or detract from their effulgence. Possibly, however, the sun is referred to. If so, we should be sorry that the *Sun*, that "shines for all," should suffer the fate of any astronomical society, whether royal or common.

NEW METALLIC THERMOMETER.—Mr. John Browning recently exhibited a new metallic self-registering thermometer, made for the Astronomer Royal. It consists of a long compound metallic bar, which acts upon two indicators of aluminum about six inches long. The latter move over two dials, one of which registers the maximum, the other the minimum temperature.

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WEST SPRUCE ST. BAPTIST CHURCH, PHILADELPHIA.

We give herewith a view, plan, and description of the new Venetian-Gothic Baptist church, now building at the northwest corner of Broad and Spruce streets, Philadelphia, extracted from "Sloan's Architectural Review and Builders' Journal," published by Claxton, Remsen, & Haffelfinger, 819 and 821 Market street of the same city. We consider it a most beautiful and chaste design.

In this edifice the architect says, in effect, "he has not confined himself to the rules of any particular period, or the special development of the style in any region;" but the church has been designed "in the spirit of early Gothic," with a tendency toward the Venetian, the latter evinced mainly in the use of different kinds and colors of stone in the exterior walls.

The walls are of stone, that used for the facing being serpentine, from Chester county, Pennsylvania, with Ohio "Clough" stone dressings.

The church will have a high-pitched open-timbered roof, slated, and finished with an ornamental iron cresting, as can be seen in our illustration.

The plan is cruciform, consisting of a nave and transepts, with aisles; and a tower and spire. The nave is parallel to Broad street, and the full length of the lot, 120 feet. The width of the church at the transept is 70 feet.

The principal entrance is through the tower, which stands on the Broad street side of the church, and, in connection with the transept gable, will make that the principal façade; although the fronts on each street are to be equally well finished.

The plan is somewhat unusual, in having the lecture-room and Sunday-school in front of the audience-room, instead of behind it; and in substituting for the usual partition an ornamental screen of plate glass framed in carved tracery of black walnut, which can be opened and closed at pleasure; so that the church, lecture-room, and school can be thrown into one grand auditorium, or be used separately.

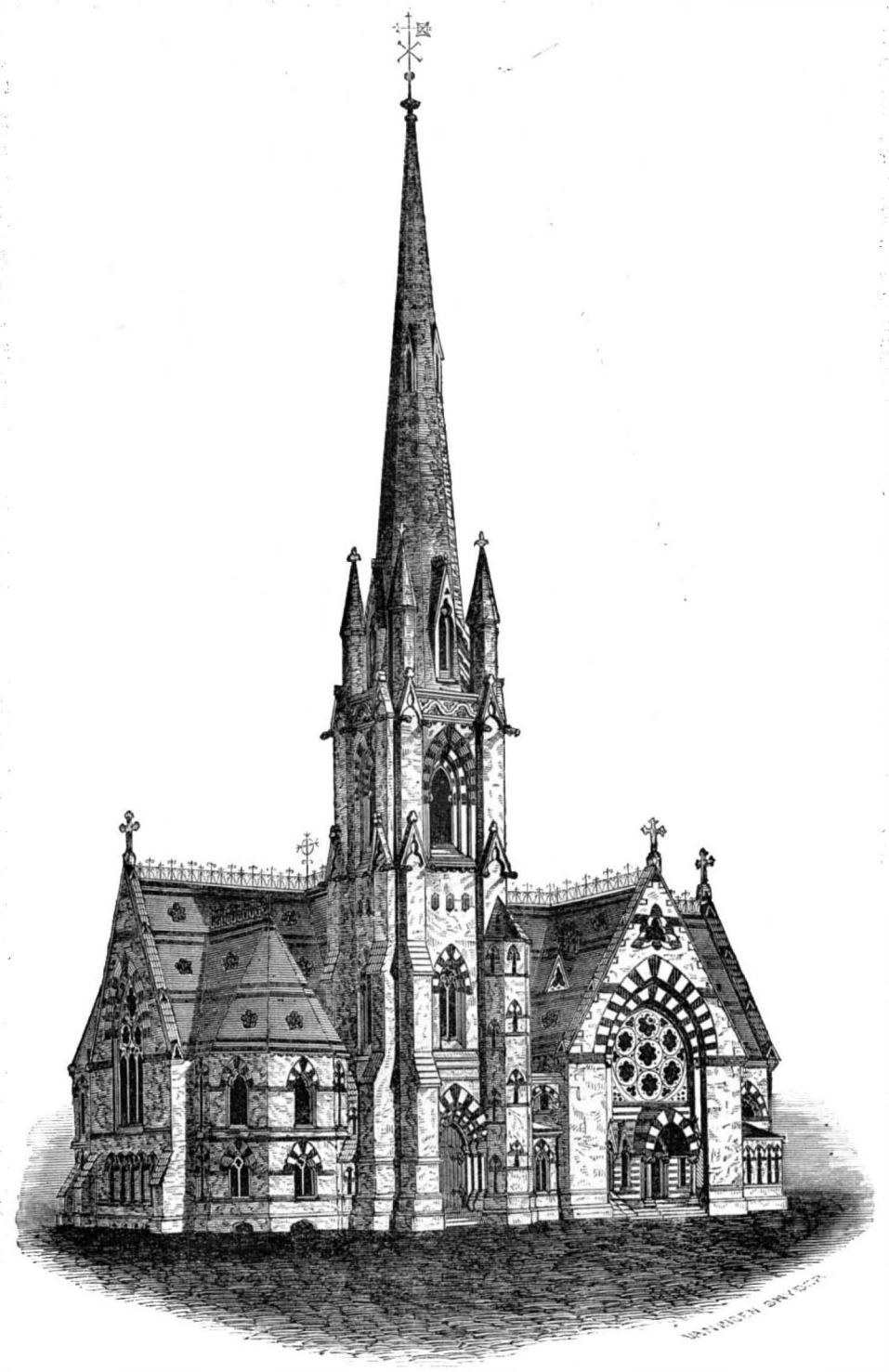
The most striking feature of the interior, however, will be the Baptistry, at the head of the nave, behind the pulpit, built of polished marble, and inclosed with a lofty tabernacle of carved walnut, having gates of wrought metal-work, richly illuminated.

Behind the Baptistry, will rise a chancel window, 19 feet broad, and over 36 feet high, enriched with stone tracery; and filled with stained glass, to be imported from the celebrated stained glass works at Munich, Germany. The leading subject of the painted glass will be the baptism of our Saviour in the river Jordan, by St. John. The other windows will also be filled with stained glass.

The organ will be placed in a gallery in one of the transepts.

The church has sittings on the main floor for over six hundred persons, and with the lecture-room, school, and galleries, about double that number.

The tower measures 30 feet at the base, across the buttresses; will be finished with crocketed gablets in its four faces; and have angle turrets, enriched with carvings. It will be surmounted by a spire banded with color, its upper portion enriched with crockets. The highest point will be somewhat over two hundred feet from the pavement. A turret staircase is carried up at one angle, and finished with an arcade having polished granite shaftlets surmounted by a stone coping. The belfry arches will be left open. Above the belfry is a clock chamber.



WEST SPRUCE STREET BAPTIST CHURCH.

The lower entrance will be enriched with four shafts of polished granite, red and black, placed alternately. Their daffodils of spring, the bending grain of summer, the fruits of autumn, and the ice-laden branches of winter. Above their foliage, this text: "While the earth remaineth, seed time and harvest, and cold and heat, and summer and winter, and day and night, shall not cease."

The exterior of various points is enriched with carvings, all different, but all appropriate. Those, for example, on the transept gable, facing the east, though like the rest, in themselves different, are all identical in their symbolism. Beneath a cross, which finishes the apex of this gable, is carved, enriched with foliage, the words, "Agnus Dei;" and following hem, at intervals, similarly carved, the words, "Lux," "Dux," "Lex," "Rex," "Alpha" and "Omega;" and, below, the text, "Blessed are all they that trust in Him;" while around the great arch, spanning the porch and rose window above it are seen carved the rose, the lily, the wheat, the vine, the lion, the crown, and the star, symbols which need no translation to those who know the blessings of a trust in him, who is "The Lamb of God," "The Light of the World," "Our Leader," "Our King," "The Alpha and the Omega," "The Rose of Sharon," and "The Lily of the Valley," "The Bread of Life," "The True Vine," "The Lion of the tribe of Judah," "The Crown of Glory," and "The Bright and Morning Star."

Below the window, a band of foliage is carried across the archway, and bears the text, "He shall feed his flock like a shepherd." Below it again, on each side of the porch, are carved, on gablets bearing the symbols of the four Evangelists, the words, "We are his Witnesses;" while the porch itself, adorned with polished pillars of porphyry, whose capitals are carved with olives and palm branches, shelters, under the overhanging arch of its door, a group in relief—a "Christus Consolator," and the inclosing text, "Come unto me, all ye that labor and are heavy laden; and I will give you rest."

The architect of this noble structure, which is destined to form one of the most attractive ornaments of the Quaker City, and an important addition to the Church Architecture of this country, which has of late been greatly enriched in design and finish, is Mr. Edward Tuckerman Potter, 56 Wall street, New York. The stone work is under the charge of Messrs. Struthers & Son, 1,022 Market street; and the carpenter work in the hands of Mr. Catanach, 1,345 Lombard street, all of Philadelphia.

A New and Cheap Form of Constant Battery.

M. J. Ney has recently communicated to the Paris Academy the description of a new and cheap form of constant battery, which if it should prove as constant as the author asserts, will be hailed as a valuable acquisition by all electricians, but more especially by those who devote themselves to electro-gilding or other forms of galvanoplasty.

To these, according to M. Ney, the new element which he proposes will prove perfectly constant, of a simple and cheap construction, and exempt from all perturbation. It consists, first, of a vessel filled with a solution of sal-ammoniac, in which plunges a plate of amalgamated zinc; second, of a porous vessel filled with native carbonate of copper (malachite or azurite), in which plunges a plate of copper.

To maintain the power of this battery it is sufficient to add from time to time a few crystals of sal-ammoniac. When the battery is to be used for telegraphy in the country or on a field of battle, etc., its transport may be facilitated by substituting, for the solution of hydrochlorate of ammonia, sand which is saturated with a solution of this salt. As long as the circuit is open the carbonate of copper is not acted on by the solution of sal-ammoniac, but as soon as the circuit is closed, this salt appears to be decomposed into ammonia and hydrochloric acid, the latter flows to the zinc plate, the ammonia acts on the carbonate of copper, which becomes soluble and its reduction sets up a secondary current of the force of one of Daniell's elements.

Unginned Cotton for Manufacturers' Use.

An esteemed correspondent, Mr. S. D. Morgan, of Nashville, Tenn., calls our attention to a great advantage to be gained by the manufacturer of cotton goods in taking his cotton "in the seed," or before being ginned and tightly compressed in bales. By ginning his own cotton the manufacturer makes a great saving, not only in that of the weight of the baling and rope used in covering the bales, but almost as much in having his cotton in the very best possible condition for carding, and if his gin be of the right sort, he has no short cotton or "flyings." The ordinary plantation gin is made with comparatively small diametered saws, having a very rapid motion in order to do its work speedily—that being the chief desideratum with the large planter or those who gin for toll. This very rapid motion of the saws jerks the cotton off the seed, and consequently either cuts or breaks the fiber. A gin constructed for the manufacturer has very large saws, very fine teeth (as many as 14 to 15 to the inch of circumference). The saw with a slow and regular motion pulls each fiber out by the rootwithout breaking it in the least.

Refining Iron Without Puddling.

We recently noticed a new process on trial at Pittsburgh for making iron direct from the ore. The following additional particulars we clip from the Cleveland *Herald*.

"We referred a day or two ago to the excitement produced among iron manufacturers by the great discovery of a means of dispensing with puddling, now in practical operation at the Shoenberger Junta Works, in Pittsburgh. On inquiry of Morrison Foster, Esq., of this city, the agent of the company, he explains that the process consists simply in combining, mechanically, oxides of iron with melted crude metal. If the mixture is thoroughly effected, the result is instantly a malleable iron superior to the best puddled balls. It is then only necessary to heat it as blooms are heated, and put it through the machinery, to produce the best quality of horse-shoe bars from materials which, if puddled, would yield only common iron, and at much less cost than puddled iron. The method employed at the Shoenberger Works is to take the melted metal direct from the blast furnace (they have two large stacks) and run into a large kettle of a capacity of five tuns. From thence it is poured, in a stream about a foot wide, into a circular trough twelve inches wide and ten inches deep, revolving on a radius of seven feet, or fourteen feet diameter. Pulverized iron ore, Lake Superior, Champlain, or Iron Mountain, is used as the converting agent. The ore descends from a hopper into the revolving trough, and covers the melted metal as fast as it is poured in. The continuous revolutions of the trough produce alternate thin layers of hot metal and raw ore, and effect the combination in a very satisfactory manner. The machinery which accomplishes this is moved by steam and hydraulic power, and is so well planned that one man, standing with his hand on valve-levers, can manage the whole operation. When the trough is full, and before the iron cools, it is broken up into slabs of suitable size for the heating furnace."

Narrow Gage Railway.

In constructing a new local railway between Manchester and Didsbury in Great Britain, a gage of three and one-half feet is proposed, as answering all the requirements of the line as well as the usual four feet eight and one-half inches width, and costing, with the rolling stock, one-third less. Railways of this guage, it is said, have been adopted in Queensland, Ceylon, Belgium, and Norway, with satisfactory results. The locomotives to be used will weigh fifteen tuns, and their speed be limited to twenty-five miles per hour. The carriages will be like our street cars, twenty feet long, six feet wide and six and one-half feet high inside, and will accommodate twelve passengers on each side, giving over thirty cubic feet of space to each.

HOOSAC TUNNEL.—The contract for the more speedy completion of this great work has at last been closed. The contract stipulated that one million of the five millions dollars to be paid for the work is to be withheld until its completion, and required bonds to the extent of a half million of dollars. The latter clause has been modified however so as to require the contractors to perform work to the extent of half a million dollars before they receive any payment thereon.

KEENE, N. H., is going into the business of quarrying and sawing marble.

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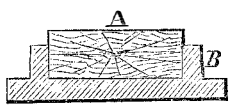
Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Combination Rail.

MESSRS. EDITORS:—Permit me to offer a suggestion in your columns on the subject of wooden railways. I believe a track may be laid for locomotives as superior to iron rails as the Nicolson pavement is superior to cobble stones. What the world wants is not only a safe, but a noiseless road. For the one, the strength of iron is needed; for the other, wood possesses peculiar advantages. My suggestion is to combine them, and this is the plan: Construct the roadway in all respects as now, but let the rail be made as follows:



This represents an end view or cross action of the combination rail; A being of wood and B of iron, of whatever dimensions may be needed for security. It is obvious that a tough wooden rail of say six inches in width and four in depth, supported on three sides by an iron rail, would form an elastic medium for car wheels, while the wear from friction, distributed over a larger surface, would be reduced. The elasticity might be further increased by a layer of rubber under the wood, and this would take up, so to speak, much of that jar and concussion which so weaken the iron and steel rails.

But the question at once occurs, Can wood be made to stand the pressure of a moving train of cars? Just here the progress of chemical science comes to our aid. By a process, familiar to your readers, wood is now prepared so that its texture is nearly as tough as that of iron, while its elasticity is not greatly, if at all impaired. Wooden rails, properly treated, would be impervious to water, and so not liable to spring from exposure to the weather, while in durability they would doubtless exceed that of iron, making due allowance for the comparative cost. The plan contemplates a permanent iron rail of the form shown, which need not be renewed for many years. The wood may be replaced as fast as worn out with great facility, being bolted or secured to the rail below with countersunk heads. It should project at least half an inch above the iron.

Such a rail, it seems to me, would secure the highest safety, since if the iron breaks short off (and the liability to such an accident would be greatly reduced by the wooden bearing) the latter affords a bridge across the fracture; while if the wood fails from any cause, the iron flanges remain to support the wheels. But the desideratum of a noiseless track is to be especially urged on behalf of the traveling public, and to obtain this no substance seems so well adapted as wood.

If railways can be constructed of wood alone for light locomotives at low speed (as proposed in a late No. of the SCIENTIFIC AMERICAN), why not of wood and iron for heavy trains at high speed? Yours respectfully, F. H. WEBB.

Hudson, N. Y.

"One More Unfortunate"---The Crank and its Improvers.

MESSRS. EDITORS.—Suppose a steam engine of eight-inch bore, twenty-four inches stroke and eighty pounds pressure of steam (fifty square inches area) and one hundred revolutions per minute; what number of square inches of piston area will equal the power of this engine, under the same pressure, if applied the entire circle of the crank, with the same force that the piston has with the crank at the point of half stroke, at the same number of revolutions per minute? I propose to apply the steam of any boiler under any pressure to the circle of the crank and continue the same power six-sevenths of all the way around. Yours, just subscribed for the paper. J. W. H.

[Possibly the very last sentence in the foregoing communication is the excuse of the writer for his not singular but hardly creditable inquiry. If he had been a constant subscriber and reader of the SCIENTIFIC AMERICAN he would not have attempted to enter upon a path which has proved so unremunerative and unsatisfactory to others whose failures have been recorded in our columns. Our correspondent imagines a rotary engine, but a more perfect one than has yet been constructed. The steam—and its direction—must in his engine follow the progress of the crank and impinge on it, or its connections, with equal force at every point in its revolution. Does he not see that this cannot be done with the crank? And if the crank is discarded from the reciprocating engine he must employ a device to take its place. What is this device?

If he retains the crank and proposes to apply the same pressure to it that it has when on the point of half stroke, *ergo* to transmit the same power through the whole revolution, or six-sevenths as he says, must not his boiler revolve with the crank, or the cylinder with reciprocating piston, and, necessarily the crank be discarded? Obviously; then his idea is to substitute for the reciprocating engine a rotary one. When he succeeds in constructing an engine of this character that works as economically and perfectly as the ordinary steam engine we shall take pleasure in giving it a very favorable notice in our columns.

In our experience as a practical engineer and our observations as mechanical editor of this paper we have seen a number of attempts to supersede the reciprocating engine and the crank. We cannot recall one that was economically successful. The best effort we ever witnessed was that of the then superintendent of Woodruff and Beach's establishment in Hartford, Conn., an engineer of recognised and undoubted ability, who built a rotary engine of elegant form and smooth action. It was employed, for a time, to drive the large machine shop of the concern while the other machine, an engine of forty H. P. was being repaired, It performed the work admirably, but used more steam and consequently fuel than the old style reciprocating engine. Undoubtedly there are cases where a good rotary would be preferable to a reciprocating or stroke engine, as where room for the engine is scant and fuel is cheap.

As to superseding the crank we do not believe it has yet been done, and, contrary to the ideas of some good engineers, we do not believe it will be done. The "loss of power in the use of the crank" which is so much talked about, we do not believe exists. We conceive it to be as much of a bugbear and having as little foundation in fact, as the fears of engineers when locomotives were first introduced that the wheels would not sufficiently grip the rails to induce propulsion. This imaginary difficulty—wholly imaginary—occasioned much study, trouble, and experiment which was useless so far as directed to the removal of a difficulty that never existed. The pressure of the steam on the piston—and consequently on the crank—is as great at one point of the stroke of a reciprocating engine (except where the steam is cut off) as at another; the length of the leverage is reduced, but when this reduction occurs the distance traveled by piston is equally reduced. Some engineers insist that the shorter the crank, or lever, the more the power delivered, as may be seen by the communications of F. R. P. on pages 2 and 44 present volume SCIENTIFIC AMERICAN, headed, respectively, "Propulsion and Dynamical Levers" and "Propulsion of Vessels." While we do not entirely agree with the hypotheses or the deductions of this writer, there is something in his argument it would be well for our Don Quixotes who conceive the crank to be a windmill to consider.—EDS.

Removing Carbonic Acid Gas from Wells, Cellars, and Wines.

MESSRS. EDITORS:—When we consider that hundreds of lives are sacrificed every year in our country by persons going into wells, cisterns, wine, and beer cellars, charged with carbonic acid gas, or "damps," as commonly called, a knowledge of the best remedies should be well diffused. I have frequently had to descend into such wells, and find three remedies successful in speedily freeing them of this gas.

A bellows, with a rubber hose reaching near the bottom, will soon blow out the gas; but such an apparatus is not always available.

Letting down a large bucket, and drawing and emptying the gas at the surface, is the next best plan.

Pouring down water is a good remedy, and should always be resorted to when a person falls from inhaling gas. Life is frequently thus saved. Burning combustibles is not only tedious, but creates litter and smoke that remain for hours to annoy the workman.

Two men spent one day in "burning" out a well, from which I removed the gas afterward in one hour by pumping up water, and allowing it to fall in a spray to the bottom again. This well was filled with gas from within ten inches of the top down forty-four feet. Wine and beer cellars should be constructed in a porous soil, or have a drain at the bottom for the gas to run down. Where the drain is impracticable, a blower should be arranged. Never enter a well until a lighted lantern has been sent down; and if it is extinguished, the well is unsafe—no one could live in it. This gas accumulates in cavities in the earth, and being much heavier than air, finds its way through crevices into wells. I knew one case where the gas poured down upon two men, some twenty feet below where it forced its way into the well being dug, and killed the men almost instantly.

Pure air is of much more importance to our well being than we as a mass fully realize. The laundry frequently causes sickness, by contaminating the air we breathe with the filth of clothing being cleansed, especially such as is charged with the excrements of children and the sick. Carbolic acid is a cheap and perfect remedy. A few drops placed in a tub full of the most filthy clothing, will destroy all smell, without rendering any injury to clothing. For disinfecting vaults, etc., it is a sure remedy. Placed in a sick room, in a saucer of water, it prevents the spread of contagion. G.

Omaha, Neb.

Steam Power---From a Late London Paper.

MESSRS. EDITORS:—I copy the following from *Niles Register*, of Dec. 9, 1815, under the above caption:

An important improvement has recently been made in the construction of steam engines (?) by which no more than one twentieth part of the coal consumed in an engine of 20-horse power or any other required power becomes necessary. The construction is as follows: A furnace holding about a peck of coals, is made movable into a large iron vessel and has a flange, which, when introduced into the vessel closes the opening in that part; in an instant the air is rarified, the expanded air passes through a pipe and presses upon the piston of a pump, and produces in this a motion of about four feet; the rod of the piston then becomes the moving power of the furnace backwards and forwards; and this is effected about sixty times in a minute. Suppose the air to be rarified about three times, there will then be an excess of two atmospheres equal to the pressure of 30 lbs. to the square inch. The expansion being uniform, there is no danger from explosion; the construction being simple, the expense is comparatively small.

I don't wish to criticise the mechanical difficulties in the above, but copy it to show that there is "nothing new under the sun"—that the caloric engine or at least its principle is old. Yet I submit that there are to-day many supposed inventions which are patented that are far more absurd and impracticable than that. F. W. B.

Good Agricultural Machinery.

MESSRS. EDITORS:—In your issue of December 16th, I noticed an article headed "Poor Mechanical Work on Agricultural Machinery" which I think does great injustice to a large class of manufacturers in this country. For while there may be some manufacturers who roughly turn their shafts and do not bore the boxes of their machines, I know from personal knowledge that a great many take the utmost pains to turn their shafts round and smooth, many using the standard gages for all their work, and the very best material the market affords. I now have charge of a reaper and mower establishment and such is the precision of work that our machines can be taken apart and the pieces piled up indiscriminately and machines afterward assembled, like a Springfield musket, from the pile.

What do you say to cut gearing, turned bolts, bored boxes, the boxes fitted with the same care as brasses in an engine connecting rod. I can show you an establisment, building thousands of reapers in this style annually, and can assure you that some if not all our implement makers are building something which deserves the name of machine because of the workmanship displayed in its construction alone. I hope you will correct the error into which you have evidently fallen. FULTON.

Lewisburg, Pa.

[We are glad to hear of an establishment where such excellent work is put upon agricultural machines. We already knew of such, but if some of the specimens we have seen in the market are to be considered examples of agricultural machines, we must dissent from the conviction of "Fulton" that most of our agricultural implement makers are equally conscientious with those of his acquaintance.—EDS.

Mr. Emery's Papers on the Best Mode of Testing Steam Engines.

MESSRS. EDITORS:—I have read this series of papers with a great deal of interest. But I wish to take exceptions to some of his points, particularly so far as the indicator is concerned. He speaks of, and indorses the Richards' instrument, but takes pains to inform us that the instrument used in the experiments was one of the best of that kind, and made by Elliott Brothers, of London. The instrument might have been a good one, and well adjusted, but I have not found it infallible. Within a few months a professional engineer of my acquaintance, being in London, had an instrument made to order by the Messrs. Elliott Brothers, and he supposed he had got a first-class instrument in every way. Being in the way of using the instrument myself, I examined it critically, with a view that if I found it superior to the American to order a pair for my own use.

In the general construction I found nothing wrong, but on putting a paper on the cylinder, making the atmospheric line, then that perpendicular to it, I found it not at right angles at the base by about one sixteenth of an inch in three inches; and this instrument was made to order for a professional engineer by the Messrs. Elliott Brothers, of London, and was new, and never had been used. I then subjected an American made instrument to the same test, that had been used, and found it practically correct in that respect.

While we are on the subject of the instrument, I might as well mention that I saw an instrument used by the United States Steam Expansion Experimenters, one of Elliott Brother's, of London. This I did not prove by the above test, but I did make some other tests to find if it was in working order—if anything like correct results could be obtained from it. I found it exceedingly foul; if I raised or depressed the piston it would not come back to zero. It had evidently been oiled with an inferior oil that, to use an expression of the engine room, "gummed." If this was the veritable Elliott instrument, the discrepancies and want of confidence in the instrument, discovered by the experimenters, are easily accounted for. That it might be "tardy" in its movements, I readily grant, and that the increase of speed, as a matter of course, would show by its tardiness.

Mr. Emery makes the broad assertion that the indicator is defective, inasmuch as it "takes no account of the friction of the engine." If I did not personally know that Mr. Emery had had practical experience as an engineer, I should say that he had never seen an indicator, nor knew anything about it. It is true, in a subsequent article, he makes a show of qualifing the above point, but sadly fails to satisfy any one. 'Tis true also, that as you increase resistance, and the consequent increment of power applied to the engine, the friction increases; this the veriest tryo in engineering knows, and also knows that the indicator does "take account of it"—every part of it—and represents it in the diagram. True, it does not separately from the resistance of the machinery, for the best reason in the world, because the friction is incident to, and a part of that resistance. F. W. BACON.

New York city.

The New French Gaslight.

MESSRS. EDITORS:—In your last number of the SCIENTIFIC AMERICAN, under the title of "The New French Gaslight," I read an account of the experiments of Ball, Black & Co.

You commit therein an error in stating that the lights are those of the Bourbouze process. In my capacity as representative of the technical part of the invention of the system which has been put in use, I wish to correct you and to call your attention to this impo tant fact. The light which you have seen for a few days past at Ball, Black & Co.'s, is produced according to the process of Tessie du Motay and Marechal, that is to say, it is the Drummond light rendered practical by means of an economical process of making oxygen gas and the use of appropriate burners.

It is owing to the desire of Professor Doremus that the firm allowed the experiment for the purpose of testing the value of the light. E. SCHWARTZWEBER.

117 East 23d street, New York city.

IT is announced that a German chemist has discovered a method of converting wood spirit into spirit of wine. The details are not yet made public, but the discovery if really made is an important one.

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BUREAU OF NAVAL ENGINEERING---SOME HARD FACTS.

Hon. W. D. Kelley, from the Committee on Naval Affairs, reported a bill, which passed the House, providing that the position of Chief of the Bureau of Steam Engineering of the Navy may hereafter be filled by a civilian; in other words, that the selection shall not be confined to naval engineers. Judge Kelley enforced the measure by stating that there was no branch of science in which more progress has been made within the last quarter of a century than that of engineering. The science of engineering, and the tools and appliances used by engineers or in the construction of steam engines, have probably improved more rapidly than any other department of science or the useful arts. The engineer corps of the navy is necessarily a small one. The number of chief engineers is but fifty-two. There are many men of mark in that corps, but the field of their operations is circumscribed. There is a much wider field for the development of engineering skill and judgment in the general civil service of the country, in the development of our mechanical and material resources, and in the wide field of the steam commercial marine. The committee believe that the Government should have access, in selecting an engineer-in-chief, to this wider field of experience and study than the navy, with its formulas, and, to use a popular phrase, red tape affords. It is not believed by the Naval Committee that our navy exhibits the highest character of engineering. Reports come to us from line officers on every station, and other observers, that our vessels move by steam alone, while those of other nations, with more adequate steam apparatus, resort to their sails while cruising on stations, and thus save the fuel ours consume, and the wear and tear of machinery they are undergoing. Line officers report to us from every station that our vessels, when they move impelled by our style of engines, move only to look at the sterns of competing vessels—even of those of the little South American States which have navies.

We have a ship said to be the fleetest on the ocean—the Wampanoag—but which cannot carry her own fuel for a month, together with food for the competent number of officers and men for the same time. So much of her room is taken up by engines, coal bunkers, fire room, &c., that the officers in command of what is boasted of as the fleetest ship in the world are compelled to occupy quarters less commodious than are allowed on ordinary merchant ships moved by steam. It is possible that in selecting some future Stephenson or Ericsson an additional office may be created; but if he shall give us a navy which, when on stations, doing merely watch duty, can move as the ships of other navies do, under sail—which, when merely making formal cruises, can, as other vessels do, move under sail—you will find that he will save each day to the treasury of the country more than the annual salary of the engineer-in-chief of the navy.

Judge Kelley charged that within the last two years our engineer corps have been buying out old machine shops and converting the machine shops of our navy yards into old junk shops; that at the Philadelphia navy yard, under the shadow of the shops of the most celebrated tool makers in the country, they have purchased, within eighteen months, tools that were superannuated twenty years ago; that they have bought tools such as cannot be found in any modern workshops in the United States or Europe; that they have paid $20,000 for three superannuated or worn-out tools which any practical engineer in the country would swear would not be worth in a machine shop the space they occupy, if the proprietors had the means of buying adequate tools; that they have paid for the scrap iron, which still retains the general form of machines, more money than would have bought new tools in Philadelphia, Newark, Providence, Worcester, or at any other point in the country at which tools for the manufacture of steam enginery are made; that if members would go to the navy yard at Portsmouth they will find there, boxed up under sheds, for which the Government has no use, and which, though bought more than eighteen months ago, have not been set up, old tools bought from an engine manufactory which was being abandoned, not because the proprietor was giving up the business, but because he had bought a new shop, and it was better for him to sell his old tools to the engineer department of the United States Navy than to remove them to his new shop near by the old one. For the Philadelphia yard they have bought a planer after eleven years' use, part of the time in Philadelphia, part in St. Louis, and part in New York, where it was bought for $6,600, when they could have bought a new one of the manufacturers of such tools for $6,000. So, eleven years of use, transportation about the country, and repairing damage, made that old tool worth to the engineers of the navy ten per cent more than a first-class new tool fresh from the shop of its makers or their rivals in business.

Such is the substance of the pointed speech made by Judge Kelley in support of the proposition of the Naval Committee. Had it been carried out at the beginning of the war, millions might have been saved to the country. Let us now lock up the barn, even though the horse may have been stolen.

THE HEATON-BESSEMER CORRESPONDENCE.

Messrs. Bessemer and Heaton are carrying on a lively correspondence in the various English scientific papers in regard to the relative merits of the processes which bear their names. Even the London *Times* has opened its columns to this correspondence, which is becoming rather spicy. Mr. Bessemer charges that the so-called steel manufactured by the Heaton process is not steel at all. He says:

In the Heaton process nitrate of soda mixed with sand is employed to genetrate the necessary amount of oxygen gas for decarburizing the pig iron, instead of employing the cheap gaseous oxygen of the atmosphere. Now, whenever solid substances are converted into gas, a vast amount of heat is absorbed and rendered latent; hence in the Heaton process so much heat is abstracted from the metal in generating oxygen gas by the decomposition of nitrate of soda that the metal solidifies while in a state of mechanical admixture with the sand and soda, and thus, instead of obtaining fluid cast steel by his process, Mr. Heaton obtains only a lump of spongy, porous metal, intermixed throughout with slags and scoria, and having the general characteristics and properties of ordinary puddled iron or puddled steel, but which is only obtained at a cost (for nitrate of soda) of more than double that of the ordinary puddling process.

The crude lump of metal obtained by the nitrate process may be hammered and rolled into bars, and be used as ordinary puddled iron or puddled steel, materials which, from their nature and physical properties, are entirely distinct from, and can never compete with cast steel. It is true that, in common with puddled iron of every description, Mr. Heaton's crude metal may be made into cast steel by resorting to the old and costly Sheffield process of melting in crucibles, a process which consumes about 3 1-2 tuns of coke for every tun of metal so melted, and with the additional cost of wages, crucibles, etc., this melting process alone costs from £5 to £6 per tun. Hence, although Mr. Heaton starts with a cheap pig iron, giving him an advantage of 20s. to 30s. per tun over the cost of the Bessemer raw material, he nevertheless employs for the conversion of one tun of pig iron (according to Dr. Millar's report) no less than 270 lbs. of nitrate of soda, which, at the present market price of 15s. per cwt., is equal to 36s. on the tun of crude iron, thus bringing up the cost of the materials employed in making one tun of crude steel by the Heaton process several shillings per tun above the cost of the high-class iron used in the Bessemer process; and when we add to the cost of the Heaton crude steel the additional cost of £5 to £6 per tun for melting, I think it will become as clear to the general public as it has long been to all practical steel makers, that the Heaton process can in no way compete with the cast steel at present in the market, either in price or quality.

To whom Mr. Heaton makes answer substantially, that the plant of his process costs next to nothing compared with that of Mr. Bessemer; that the whole of Mr. Bessemer's statement are unsustained by facts or theory; that steel made by his process can be melted in a Siemens' or other furnace, and run into ingots as good as any Bessemer steel; and very much cheaper, which he claims is what hurts Mr. Bessemer; in proof of which statements he refers to a certified cost sheet, and puts in a final shot by inviting Mr. Bessemer to call at the works where the Heaton process is now in operation and witness the tests applied to the products of the Heaton process.

The ironmasters on both sides the Atlantic will read this correspondence with interest, and await further developments before forming judgment upon the case.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The editor of the Chicago *Railway Review* says: "We had occasion to pass over the Michigan Central Railroad during the recent storms, which caused so much delay on many roads. The trains were of course behind time; but, in grateful contrast to the condition of passengers in the pre-Pullman-hotel-car-age, where one ran imminent risk of doubly dying—by cold and starvation—we found everybody in common with ourselves, patient over a delay in which the elements alone (and not man) were hostile. In goes far to reconcile one, to even so serious a matter as delay in business and failure to make connections, to find one's breakfast necessities provided for as if he were at home. In fact the experience of being 'snowed in" is no longer without its romantic, not to say pleasant, aspects.

A correspondent of the Chicago *Times*, on the Union Pacific road, devotes a paragraph to the coal deposits in the vicinity of Carbon, six hundred and fifty three miles west of Omaha. He describes the surface as black with the outcrops of the immense beds. At Carbon a bed sixteen feet in thickness is being worked, several tunnels having been run into the side of the hill, and from one to two hundred tuns are daily taken therefrom. The coal is of excellent quality, and well adapted for use on locomotives.

It is reported that the British Government proposes to give some reward of honor to Major Palliser, whose inventions, particularly his chilled shot, have been and are productive of enormous saving to the country, while they add greatly to the efficiency of its armaments.

One of the silver palace cars owned by the New York & New Haven Railroad Company, took fire on Dec. 29th, at the depot on Twenty-seventh street, New York city, and was nearly consumed. The fire originated, we understand, from the overheating of the apparatus for warming the car. This is the second silver palace car owned by the company that has been seriously damaged by fire. This company's machine shops, at New Haven, were also recently destroyed by fire; loss about $100,000.

Very extensive additions are being made to the celebrated Washburn & Moen Wire Works, at Worcester, Mass., consisting in part of a new building 500 feet long by 50 feet in width, and two 400-horse power engines. The present capacity of the works is thirty tuns per day which will be doubled when the present enlargement is completed.

Texas is growing a cotton that is reported superior for poor soil or uplands. It yields largely, and in strength is superior to the ordinary cotton.

The first day of December witnessed the laying of the first rail on the Rockford, Rock Island & St. Louis Railroad.

A company has been organized at Palmyra, Mo., to manufacture agricultural implements. Capital $100,000.

The cotton mills of South Carolina are thriving and many are being enlarged. The Sprague Manufacturing Company, of Providence, are also reported to have purchased the Columbia canal water power for the trifling sum of $200.

A manufactory of boot blacking in Pennsylvania turns out 25,000,000 boxes per year.

During the past season the Surveyor General in St. Croix Valley, Minn., is said to have sealed one hundred and twenty million logs.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1 00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

D. and S., of Mich.—200 inches of water under four feet head is not theoretically or practically equal to 100 inches under sixteen feet head, either in quantity or in the power it will exert in driving machinery.

H. B. E., of ———Compressed air can be used as the motive power for any form of steam engine in use, but the principle of condensation in low pressure engines can not obviously be applied to compressed air.

E. B. R., of N. Y.—The pressure of water upon the sides of a cistern or pipe containing it is directly as its hight. The diameter of the column has nothing to do with it.

D. U., of Ohio.—Soluble glass would we think not answer well for the coating of the insides of cider and wine casks. Although pure block tin faucets would not be likely to injure such liquids we think a good wooden faucet preferable to any metal one for such purposes.

W. H. T., of Wis.—The only preventive against the accumulation of frost upon windows that we can recommend. is the use of double glazed sashes. This gives a stratum of air between the inside and outside glass, a very bad conductor of heat. and prevents the congelation of moisture upon the inner panes.

J. A. B., of Conn., asks why the electricity generated by a swiftly running belt cannot be used to light the gas burners in a shop. He proposes a wire with projecting prongs placed, to gather the electric fluid, near the belt, and leading through the shop near each gas burner. The only difficulties he may meet are the want of sufficient energy in the initiatory spark and the cost and trouble of the connecting apparatus.

J. B., of Ohio, is a raiser of tobacco "for his own use" and finds it too strong for smoking. He asks how it may be made milder. We advise him to expose the leaf, moistened with water, to the sun's rays for a few days.

R. P. S., of Ohio.—"What is the best length for shot gun barrels; should the bore taper toward either end or be straight; how is percussion paste made?" The best length for the barrels of fowling pieces or rifles is not yet settled by sportsmen. Some insist on a length of 26 inches while others believe 18 inches to be ample. We incline to the opinion that as good an effect can be produced by a barrel of 18, or only 16 inches, as by one of greater length. The bore for shot guns should not taper. No advantage is gained by tapering either from muzzle to breech or *vice versa*. The fulminate used in persussion caps is made from mercury, nitric acid, and alcohol. Common starch or dextrine is used to give the crystals cohesiveness and form them into a paste, and a thin water proof varnish is used to defend the fulminate from moisture. We do not advise its preparation by one not possessing chemical knowledge. Ure's Dictionary gives the formula and details for its preparation.

C. B., of Iowa.—This correspondent sends us an article descriptive of a sketch intended to illustrate his idea of a velocipede. It is in short, a velocipede, or the propelling power, inside a wheel, the outside diameter of which he states to be about 6 feet 6 inches. The device is simply a circular horse power or treadmill, the operator propelling himself and his contrivance with hands and feet. It is hard to believe it will supersede the style now in use although C. B. says it "works."

J. W. D., of———All other things being equal, the size of the speculum in a reflecting telescope adds to its power, as it gives increased illumination and consequently admits of higher powers in the eye pieces. We think it would be extremely difficult to cast a speculum 12 feet in diameter, as the metal requires extreme care in cooling to prevent cracking, and also care in pouring and grinding. Such a speculum if made would be enormously expensive. The length of tube required would depend upon the focal distance to which the reflector was ground.

E. B., of N. Y.—There is no foundation for the assertion that a ship loaded with cotton will, all other things being equal, make quicker time than one loaded with iron.

J. H. M., of N. Y.—Varnished maps can be cleaned from fly specks by washing if their surfaces are not cracked. Freckles may be removed by the following recipe: Blanched bitter almonds 1 oz; blanched sweet almonds ½ oz; beat to a paste, add one pint of pure water, strain through a piece of coarse muslin and add powdered corrosive sublimate, 10 grains, dissolved in a little alcohol. Shake thoroughly before using and apply with a soft cloth, and wipe off gently. Corrosive sublimate is a poison when taken into the stomach, therefore don't get it on your lips.

J. C. D., of La.—The relative value of wood and bituminous coal may be stated thus: Bituminous coal 23·50°; Wood 17·50°. In common use, two cords of hard wood are considered to be equal in heat giving qualities to one tun of coal.

D. B., of Mass.—The article on "Green Color for Sweetmeats" is on page 146, Vol. XIX, of the SCIENTIFIC AMERICAN.

H. H. B., of Ohio.—The humming sounds of telegraph wires is due simply to their vibration by currents of air. They are, in fact, only modifications of the Æolian harp.

M. S. W., of Texas.—"Will not a steam boiler 30 inches diameter bear—all other things being equal—one fourth more pressure than one of 40 inches diameter?" Ans. Yes. "Also, is not the strain on the hoops of a cistern 10 feet diameter double that on those of one 5 feet diameter with the same depth of water?" Ans. No. See Silliman's Physics, page 155, paragraph 193, also reply in this column, current issue, to "E. B. R.," of N. Y.

G. H. S., of Mass.—Modeling wax for taking impressions of coins, medals, etc., may be made by melting shellac to which add when fused one-fourth by weight of Venice turpentine. It may be colored by any pigment to produce the shade desired. When used it should be melted and poured or pressed upon the object and removed when set or cooled.

E. P. L., of Ill.—"What size pulley should be placed on main shaft of engine making 150 revolutions per minute to drive a circular saw of 48 inches, its pulley being 24 inches diameter." A saw of 48 inches diameter should run about 500 revolutions per minute. To do this would require a pulley on the shaft that makes 150 revolutions per minute, of 6 feet 8 inches. If, however, the stock to be sawed is soft wood and clear, the pulley may be seven feet in diameter. Thus, assuming 500 revolutions for the saw—which is laid down by practical sawyers as correct—500 divided by 150, the revolutions of the driver, equals 3⅓. Multiplying by this the diameter of pulley on saw, or the driven pulley (24 inches) is 80 inches which equals 6 feet 8 inches, the size of driving pulley.

J. B., of Ind.—Other substances beside the diamond will scratch or cut glass. Some specimens of quartz and even very hard steel will scratch glass. The test is no satisfactory means of distinguishing between the diamond and fine specimens of quartz crystals.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,302.—HORSE COLLARS.—Charles K. Marshall, New Orleans, La. October 28, 1868.

3,342.—TORTION SPRINGS.—J. E. Holmes, New York city. November 3 1868.

3,555.—APPARATUS FOR INDUCING MOTION IN MOBILE SUBSTANCES BY THE ACTION OF AIR AND STEAM IN COMBINATION.—John T. Hancock, Boston Mass. November 23,

3 560.—MANUFACTURE OF FELTED FABRICS AND WEARING APPAREL AND OTHER ARTICLES FROM THE SAME.—John Falconer, New York city. November 23, 1868.

3,573.—ATMOSPHERIC HAMMERS FOR CRUSHING ORES AND OTHER PURPOSES—H. W. Colver, Brooklyn, N. Y. November 24, 1868.

3,574.—GEARING FOR MULTIPLYING MOTION ON A SINGLE SHAFT.—L. S Fithian, Brooklyn, N. Y. November 24, 1868.

3,584.—MACHINERY FOR MANUFACTURING CIGARS.—R. A. Bright, Providence, R. I., and L. B. Stone, New York city. November 25, 1868.

3,596.—SAD-IRONS, AND THE MEANS FOR HEATING THE SAME.—S. M. Johnson, Lockport, N. Y., and M. C. Turner and Robert Turner, New York city, November 25, 1868.

3 609.—PADDLEWHEELS FOR STEAMSHIPS.—Charles Seymour, La Porte, Ind., and Washington and Fitch Raymond, both of Cleveland, Ohio. November 26, 1868.

3,610.—HARVESTING MACHINES.—D. M. Osborne, Auburn, N. Y. November 26, 1868.

3 619.—OIL CUPS OR LUBRICATORS FOR MACHINERY.—Henry L. Fearing, President of the New England Patent Oil Cup Company, Boston, Mass. November 27, 1868.

3,631.—MANUFACTURE OF STEEL.—Thomas S. Blair, Pittsburg, Pa. November 28, 1868.

3,649.—APPARATUS FOR RECEIVING AND DELIVERING MAIL BAGS AND PACKAGES ON RAILWAYS.—F. K. Sibley, Auburndale, and L. C. Wade, Newton Upper Falls, Mass. November 30, 1868.

3,659.—TUCK MARKERS FOR SEWING MACHINES.—H. W. Fuller and Isaac W. Barnum, New York city. December 1, 1868.

3,723.—CARRIAGE AND LOCOMOTIVE WHEELS.—D. P. Nickerson and W. S Streator, Cleveland, Ohio. December 7, 1868.

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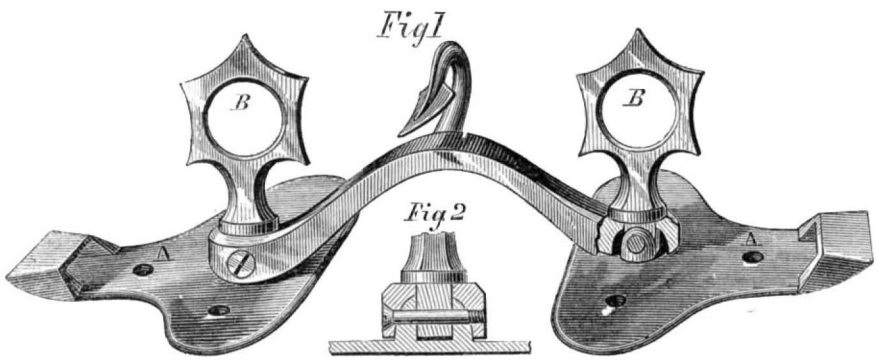
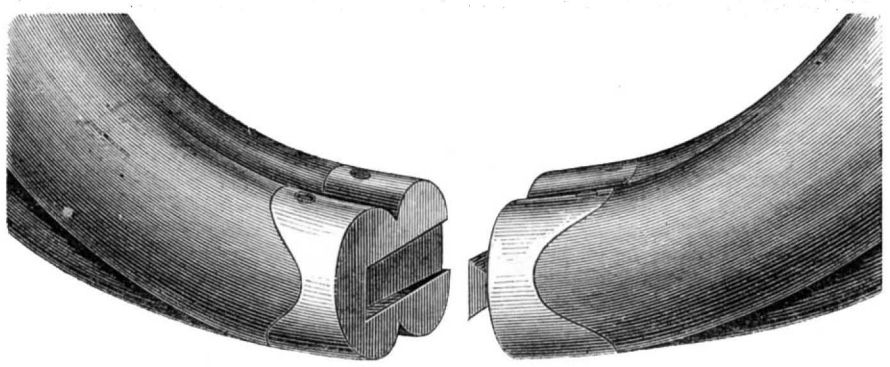
Improvement in Harness for Horses.

The first of the accompanying engravings represents a new style of horse collar which opens and fastens at the bottom. By its use the collar rim is not strained in removing it from the horse's neck, the collar is removed with the harness, and time and trouble saved. Beside this, the not merely an apparent cruelty to the horse in removing or putting on the collar is avoided. It cannot be a pleasant operation to the horse to have his ears borne backward or jammed forward, and his head compressed while the collar is being forced on or pulled off. The head and neck of a horse is almost as tender and susceptible of pain or injury as those of a human being, a fact worthy consideration.

The ends of the collar under the neck are seated in metallic sockets; they being secured by screws, and the faces of the sockets having, one a dovetail, the other a suitable recess for its reception. The union is effected instantly by sliding the dovetail tenon into the corresponding recess and as easily removed. The construction and advantages of this device are sufficiently apparent without further detail.





SHARP AND SHANNON'S IMPROVED HORSE COLLAR AND PATENT HARNESS TREE AND PAD.

The harness tree and pad are shown in Figs. 1 and 2. The pads are of heart shape, giving a considerable bearing surface on the animal's back, and being elegant in appearance. They are of metal or wood, preferably of the former as combining strength and lightness, and are lined with any suitable material. The outer ends are formed with a square loop, through which the strap suspending the trace buckle is passed, its end secured by a rivet or screw at A, Fig. 1. The bridge, or tree, has sufficient arch to keep it from resting on the horse's spine, and has at its ends square mortises for the reception of the lugs of the pad and the tenons of the terrets, B. Both the pads and the terrets are secured to the tree by a single bolt or rivet, as seen in the section, Fig. 2. The Horse Collar patent bears date August 25, 1868. The Harness Pad was patented November 17, 1868. Both through the Scientific American Patent Agency.

The simplicity and advantages of this method of constructing these portions of harness appear to be sufficient to recommend them to all owners of horses. Further information may be obtained by addressing the patentees, W. A. Sharp or J. A. Shannon, Tama City, Tama Co,, Iowa.

SUMMARY OF THE VELOCIPEDE.

The first patent on the velocipede of which we have any record, was as early as 1818, granted to W. Clarkson, Jr. The model was destroyed at the time of the burning of the Patent Office in 1836, and we have not been able to find his claim to learn the nature of the invention.

Velocipedes were in use in England it is said in the latter part of the last century, but were after the plan defined by Webster in Merriam's Unabridged Edition, which says:

VELOCIPEDE [*L. velox*, swift, and *pes*, foot], a carriage for one person, having two wheels placed one before the other, in the same line, and connected by a beam, on which the person sits astride, and propels the vehicle by striking the tips of the toes against the earth.

This style is still in use to some extent in Paris, and is claimed to be equal in many respects to the kinds now generally used, which are propelled by the foot and crank, or hand and lever. The old ones were more easily controlled, there is no doubt, but the degree of velocity cannot be attained from striking the toes against the ground that is acquired by the crank movement. A London paper, printed in 1822, has the following item:

A NEW VELOCIPEDE.

A man upon a new sort of velocipede attracted a number of people together at the Elephant and Castle, London, on Thursday, to witness his activity and the swiftness with which he travels. He is a shoemaker by trade, and finding the trade bad at Newark-on-Trent, in Nottinghamshire, of which place he is a native, he built this mechanical horse, as he terms it. It is on a different plan from the others. It is worked by two handles, which set two wheels in motion, and cause two levers in front to be put in motion, which set the machine going at the rate of at least six miles an hour. It is the completest machine of the kind that has as yet been invented. He has traveled in fine weather sixty miles a day. He has two iron stirrups in which he places his feet; they keep him steady on the saddle.

One of our largest carriage manufacturers in this city employs all his force in buil ing velocipedes, and his orders vastly outnumber his ability to supply the demand.

In Paris there are not only manufactories of these new locomotives, but founderies where the iron work of which they are composed are cast. One of these employs two hundred and fifty workmen. They have become so common in the streets of that city that no person takes the trouble to stop and look at the riders. The novelty has passed away, and the little machines may be seen any hour trundling around with velocity in the most crowded streets, amid a network of omnibuses and carriages.

A Lyonese velocipedist is willing to make a bet for any amount that he can beat the fastest trotter in a race. Since our last article on this subject a velocipede for running on ice has been successfully tried on one of the Brooklyn park ponds.

With such skill as our inventors can bring to bear we expect to see a machine so constructed that it will answer the purpose requisite for land, ice, and river travel. These three conditions have been already overcome by different inventors, and patents are pending on some very ingenious contrivances, which have passed through this office on their way to the Patent Office.

But now what is wanted is a combination of the mechanism exhibited, in some of these several inventions, into one machine, so that a person may ride and cross rivers on ice, or by water, without dismounting. A great number of letters have been received at this office during the last few weeks on this subject. Some inquire the cost, others the name of manufacturers, and many wish to know the best machine. One gentleman writes as follows: "I am a physician, and would like to use a velocipede instead of a horse and buggy if it will answer, and not require too much labor to propel it. Please give the address of a reliable manufacturer of the article. Is there any self-propelling vehicle made that will be safe and not too costly?" etc.

Improvement in Machinery for Husking and Shelling Corn.

With all its advantages it must be confessed that labor saving machinery, especially when applied to the work of the farmer, is terribly destructive to the romance with which poets have invested the pursuit of the agriculturist. The hum and buzz of the threshing machine, however suggestive of unlimited plenty and profitable prosperity, does not bring up the associations recalled by the regular reverberations of the old fashioned flail. And the husking machine arouses regretful recollections of the merry husking frolics, at which the finder of a red ear of corn rivaled its glow with his blushes as he exacted the forfeit from his fair neighbor. But the sentimental has no place among the utilities—the inventor is an iconoclast.

DICKINSON'S COMBINED CORN HUSKER AND SHELLER.

The engraving presents a view of a very useful machine in which the operations of husking and shelling are successfully combined. It may be driven by hand or power, and can be used in the corn house or barn, or taken to the field and worked at one shock after another, a perambulating worker that does not require the material to be brought within reach of its iron arms. For this purpose the machine is constructed with broad tired wheels and drawn through the field by a team. In the barn it may be driven by horse power, as is the threshing machine.

It husks, shells, and bags the corn at one operation, requiring ouly the attention necessary to arrange the ears in the feed trough to present the small ends first. The husks fall from an incline to the ground, the cobs are dropped in front, and the kernels are deposited in a bag as shown.

Further information may be obtained by addressing the patentee D. A. Dickinson, at 127 South Paca street, Baltimore, Md.

EMERY WHEELS---HOW THEY SHOULD BE MADE.

Though an old appendage to the machine shop, still perhaps emery wheels are not so much used and appreciated as they would be if more attention were given to their construction. It has been customary and, for aught we know, now is, to make them of white pine boards glued up from circular pieces of the board, three, four, or more of them according to the thickness required, thereby presenting at the periphery the grain of the wood in all its positions; endwise, sidewise and in all the intermediate positions.

Now, it is well known that all the woods, particularly the soft woods, swell or shrink in seasoning very much more laterally than longitudinally of the grain, and of course if moisture is present the wood will swell more laterally than longitudinally, thus leaving hills and hollows over the surface of the wheel, constantly changing hill for hollow, hollow for hill.

It does not do to say, "then turn off the wheel and true it" inasmuch as every time you cover the wheel you wet with the liquid glue and expand it unequally; when we clean the wheel we have again to wet it and with the same results.

It would naturally be suggested, under these circumstances, to use metal for our wheels. This is found impracticable because the metal is too rigid—not sufficiently elastic—even when covered with thick leather.

The requirements, then, are a sufficient elasticity, and that the swelling and shrinking shall be uniform. This may be approximated by making the wheel of white pine wood cut in radial segments so as to bring the grain of the wood longitudinally as nearly as possible parallel to the surface of the wheel. For an eighteen inch wheel make it of eight segments which, when turned off, nicely balanced, and covered with thick sole leather, and that turned off at a mod. erate speed, will be true, elastic, and likely to remain so. It is important that the wood should be of the same density; the wheel should be, if possible, made up from the same board to insure equal elasticity throughout the whole surface.

Before the final finish in turning off it should be niccly balanced to insure its being round when finished. Covering the wheel should be left to the expert in using it, who will soon find the grade of emery suited to his work.

We have had some experience in polishing hardware, plane irons, chisels, compasses, calipers, etc., and have found for a finishing wheel (after a good fair surface has been obtained) the following mode to work well and rapidly, giving a good fair polish answering allthe requirements for such tools. We gave the wheel a coat of say No. 60 emery taking care to have it even and smooth. Melt beeswax in a vessel, stir in flour of emery (keeping the mass warm in the meantime) until you make a paste as thick as you can. Now remove it from the heat, but still stir it so that the emery won't settle to the bottom.

When cold rub this on the wheel until a good coat is formed, then start up your wheel and apply a flint to it to smooth the surface and the wheel is ready for use. Should it be too harsh apply another coat of the composition and follow with the flint until the required fineness is acquired.

A wheel treated in this way will last for years by renewing the composition as required, being careful always to keep it perfectly balanced; without this the work will be wavy and the coating will wear off on the heavy side.

SENATOR MORTON, of Indiana, has introduced into the Senate the proposition forbidding the landing of any submarine cable in any part of the United States without the consent of Congress.

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Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street, New York.
☞ "The New York News Company," 8 Spruce street.
☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.
☞ Tubner & Co., 60 Paternoster Row, London, are also Agents to receive subscriptions.
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VOL. XX., No. 4....[NEW SERIES.]....*Twenty-fourth Year.*

NEW YORK, SATURDAY, JANUARY 23, 1869.

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WE are now printing 35,000 copies of the SCIENTIFIC AMERICAN, and subscriptions are rapidly flowing in, from Maine to California—from the Lakes to the Gulf. Our columns offer one of the very best mediums in the country for advertisers who value a large circulation. A word to the wise is sufficient.

AMERICAN BEET ROOT SUGAR.

Many causes are now at work to interest the capital of this country in the production of beet root sugar. Among these may be enumerated, first, the depression of the sugar trade of the West Indies consequent upon the competition of European beet root sugar, which threatens to compel the abandonment of the business on many plantations. Second, the changed condition of affairs in the sugar growing districts of the United States on account of the abolishment of slavery and the increased cost of labor resulting therefrom. Third, the recent introduction and success of the diffusion process in the East Indies, which renders it extremely probable that the same process will very much cheapen the production of beet root sugar. Fourth, the success which has been achieved by some establishments already devoted to this industry in this country, which demonstrates the feasibility of a further extension of the manufacture.

We have not yet learned the success which the Roberts diffusion process has met with in its application to beet root sugar extraction in Germany, where it is now undergoing a term of probation; but whether it succeeds or fails, we do not entertain a doubt that the beet, and not the cane, is to be the chief source of sugar supply for the future.

The beet has the advantages that it can be raised upon a very much more extended portion of the earth's surface; it can be worked for a long time after it is harvested, a very great advantage over the cane; and with labor at equal rates, it will yield a given weight of sugar of equal quality at a less cost than cane. These are facts capable of demonstration. Our attention was called to this subject at a time which presented much less favorable auspices than the present for the establishment of this industry in America, the period when the blight of civil war was resting upon the land. At that time we obtained from some gentlemen, one of whom had become familiar with the matter by long practical experience as superintendent of a beet root sugar manufactury in Europe, estimates of the cost, expenses, and probable profits of a similar establishment here, which we may at some future time after some changes to suit the altered condition of affairs lay before our readers.

Very few are aware of the enormous quantity of sugar used in this country, and the extremely small proportion grown here. The reports of the Commissioners of Agriculture show that the United States consume over one billion of pounds of sugar, and forty-five million gallons of molasses annually. Of this great total not one per cent is of home production, while every pound ought to be grown on our soil.

The fact has long been established that, owing to peculiarities of our soil and climate, beets grown in this country contain from one to two per cent more saccharine matter than those grown in Europe. In the manufacture of beet root sugar circumstances are all in our favor except the one item of labor, but as labor only represents about 34 per cent of the cost of production; the difference between its value in this country and in Europe is nearly counterbalanced by the cheapness of our lands and the increased product, so that without taking into account the tariff on sugar we could nearly compete with French and German producers.

The amount of revenue received by France from the sugar industry is greater than from any other one source. In this respect it is to France what the malt tax is to England. Now possessing advantages superior to France in every particular except cheap labor, it is we think impossible to show why this industry should not spring at once into healthy activity, if capitalists would open their eyes to the promise of profit it offers.

DO LABORING MEN HAVE TIME TO STUDY?

"All work and no play, makes Jack a dull boy" is a true saying if not a model of literary excellence. Its meaning is that mind and heart as well as muscle need exercise. Man is a complex being. Body, mind, and soul need to be mutually and harmoniously developed, or the human machinery becomes out of balance, and speedily shakes itself to pieces. A certain class of social philosophers have taken it upon them to assert that the laboring classes in this country, albeit they perforce cultivate muscle enough, do not, and cannot, for want of time, cultivate soul and mind as they ought. A distinguished essayist, hailing from Boston, the American Athens, has taken up the pen to urge that the laboring classes play too much and study too little, that the nature of the case hardly admits of much effort at mental improvement. So many hours' labor and such hearty meals to get through it all are required, that any attempt at intellectual improvement on the part of the working classes, is, in our Boston philosophers' opinion, necessarily as the gait of the ox to that of a trotting horse.

We have a word to say upon this subject, and we shall begin by agreeing with our essayist, that workingmen, especially young workingmen, study too little, but we dissent totally from the statement that there is anything in the nature of their labor to prevent them as a class from successful study, if they could be induced to undertake it systematically.

Let us see. It is asserted that they eat too heartily, that they *must* eat too heartily to be fleet minded. We admit, because our experience as well as physiological science proves it, that a hearty meal cannot be followed immediately by vigorous mental application. The attempt to do it must inevitably work ill to body and mind. But we also know from theory and practice that the last meal of the day should be, especially to the laboring man, a light one. This meal precedes the hours of leisure generally possessed by laboring men, the hours which are too generally spent in smoking, theater going, billiard playing, drinking in many sad cases, or what is scarcely better, a season of mental and physical inanity by the fireside, slowly but surely degrading all the faculties.

Now let it be distinctly understood that we do not object to harmless amusements *per se*. If workingmen will not study, they had better play than smoke, drink, or sit by the fire and mope. We believe in the *duty* of recreation. But we also believe that study itself *is* recreation to a man whose muscles have been in active play for ten hours of the day, and the best kind of recreation, too, when the last meal has been, as it should be, a light one. Then the body rests while the mind is fresh and vigorous, and two or three hours of profitable and most interesting intellectual enjoyment can be had at far less expense than the pipe, the billiards, or the theatre demands.

Let us now look for a moment at the question of time. Suppose a laborer to work ten hours, and to devote two hours per day to meals and going to and from work. There remain twelve hours out of the twenty-four. Allow nine hours of this for sleep—an hour more than necessary for most persons—but say nine hours; three of leisure remain. But suppose one hour of the three to be spent with the family, there are still two hours of time for quiet study. Now exclude Sundays from the calculation, and allow one secular evening for amusement solely, there remain ten hours per week for study—an amount of time that would, with ordinary intelligence, answer to master the rudiments of the French or German language in a single year, thus opening a new and rich field of amusement and culture. Ten years of such a course would give a man the mastery of the French and German tongues, a fair knowledge of mathematics pure and applied, an outline of the physical sciences, and skill as a draftsman. The writer of this article, still on the sunny side of forty, asserts that the average of all the time he has been able to devote to study during his life has been considerably less than two hours per day. Let any mechanic at the age of twenty consider how much advantage the above acquirements would be to him at the age of thirty, should he obtain them, and then go to work and get them. The requisite books can be obtained for less than many a young man spends for cigars during six months. Twelve years since we were in a machine shop in the center of New York State, where we were having a model constructed. The young man to whom the foreman and proprietor had assigned the work attracted our attention from some remarks which seemed to indicate a higher cultivation than is usually met with in young men occupying similar positions. Thereupon we set ourselves to draw him out. We found him familiar with the higher mathematics, an expert draftsman, and thoroughly posted in natural philosophy and the chemistry of the metals. He had commenced French and German. All these accomplishments were the reward of evening study, pursued steadily since the date of his apprenticeship, commenced at the age of sixteen. This young man was at that time just past twenty-one, in apparently perfect mental, moral, and physical health. He has since risen by successive steps to foreman, and is now a partner in the same establishment, a man of wealth and influence.

The essential character of recreation is that it transfers the strain from one part of the vital machinery which needs rest to another that does not, thus equalizing wear. But the human system is not like a lathe or a steam engine, incapable of repairing itself. As soon as rest is given to any part of it, if healthy, it commences to repair itself. But a condition of perfect rest is that the mind shall be wholly withdrawn from the consideration of fatigue, that toil should be forgotten in the absorbing character of the recreative occupation. What, we ask, is better calculated to accomplish this result than a proper course of study?

We might name many other bright examples which prove conclusively that the tendency of physical labor is to clear the mind and fit it for study, but we forbear. Let no young man under ordinary circumstances excuse himself for ignorance of the rudiments of knowledge. It is as true of this as of other things that "where there is a will there is always a way." In a recent article on self-education, we endeavored to point out in a brief manner a way in which young men might, if disposed, do something toward educating themselves, and we may in the future return to the subject to show that association will prove in this, as in all other relations of life, of great value if organized upon a proper basis. We may also give, in due time, a plan for an organization adapted to the wants of young mechanics in rural towns and large manufacturing establishments.

INCREASING THE POWER OF STEAM BY SUPERHEATING.

One of our numerous inquirers asks if he cannot increase the power of his boiler by superheating his steam. He expects to double its power in this manner; to use his own words: "Passing the steam through a two-inch pipe, 12 feet long, the pipe being heated to 600°; a check valve, placed between the heated portion of the pipe and the boiler, to prevent back pressure, and thus superheating the steam." He asks, also, "what degree of heat has steam at 100 lbs. pressure to the square inch, and what at 200 lbs?"

These last questions we will first answer. At 100 lbs., steam is 338°, and at 200 lbs., is only 387° (or a fraction less), leaving a difference in temperature between the 100 lbs. and 200 lbs. pressure of only 49°. Although our correspondent does not explicitly state the fact, he evidently intends to carry his superheating steam pipe into his furnace. It is a matter for inquiry why he wants a check valve between the heated portion of his pipe and the boiler. He says to "prevent back pressure on the boiler." True, but what about the boiler pressure necessary to fill his superheating pipe? If his pressure in that is greater than in the boiler, how is he to lead steam from his boiler to take the place of his superheated steam used in the cylinder of his engine?

The advantages of superheating steam are, we think, too highly estimated, and its disadvantages too little regarded or noticed, generally. Ordinary steam (the vapor given off by boiling water in a closed vessel) contains, mechanically suspended, a large amount of water; it is saturated steam, not pure steam. Even without any appreciable diminution of force by condensation, the water held in suspension weakens the power of the steam. Superheating, or additional heating, sufficient to convert the water in the steam into steam, pure and simple, is undoubtedly economical if it can be done without such an expenditure of fuel as to neutralize its economy; but it will be seen that the addition of heat to the steam, at ordinary pressure, does not correspondingly increase its power or pressure per square inch. Very "dry," or highly heated steam, exerts an injurious influence on the parts of an engine with which it comes in contact. It contains less of the lubricating properties than steam not wholly denuded of its watery particles. Atmospheric air generally contains quite a large proportion of moisture (water), but when this moisture has been all evaporated by heat, the air possesses no lubricating property, a fact which is a constant source of annoyance to users of hot-air engines. The working parts in contact with this perfectly dry air are "cut" and injured, when they should be kept in a condition of constant lubrication, and thus protected from inordinate wear. So the superheating of steam may be carried to excess, costing more than the gain, or supposed gain, by excessive heating.

Finally, we do not believe the power of a steam boiler can be doubled by any method of superheating the steam it generates, and we think that steam dry enough and powerful enough can be generated in an ordinary boiler without any special arrangement for superheating.

PATENT OFFICE CONTRACTS.

Senator Ferry offered a resolution, which was adopted, directing the Secretary of the Interior to transmit copies of all correspondence between him and the Commissioner of Patents relating to the contracts and supplies of stationery for the Patent Office; also, copies of all orders of the Secretary appointing Committees to examine and report upon such contracts, with copies of the Committees' report.

It appears that Commissioner Foote, having declined to pay the bills of the contractor for furnishing stationery and bond paper for the Patent Office, on the ground that there was fraud in the contract, the Secretary of the Interior appointed a commission, composed of B. F. James, Norris Peters, and E. W. Griffin, principal examiners in the Patent Office, to inquire into the alleged frauds.

The charge is now made that these Commissioners were in collusion with the contractors, and that their report amounts to nothing. On the other hand, the Commissioners declare that they investigated the whole matter thoroughly and impartial-

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ly, and came to the conclusion that the bills must be paid according to contract, unless fraud is shown.

According to the report a contract was made by a former Commissioner for 600,000 sheets of bond paper at eight cents per sheet. We understand that Commissioner Foote and the Printing Committee of the House have made investigations, and they are of the opinion that there are evidences of flagrant frauds.

It appears to us to require considerable charity to conclude that eight cents per sheet is a fair price to pay for ordinary bond paper. The transaction has about it a suspicious look, and we hope the Commissioner will fearlessly carry on the investigation. The telegraph reports that Secretary Browning is dissatisfied with Commissioner Foote's action in this matter, and is making efforts to secure his removal. Browning is a queer fish, but we can scarcely believe that he wants to remove an official who undertakes to expose frauds. We shall see.

IMPROVEMENT IN FINISHING PICTURES.

Among the most recent patents, is the one granted to Mrs. Sarah A. L. Hardinge, artist, 57 Fleet street, Brooklyn, for a method of finishing pictures, specimens of which we have examined. Very beautiful and charming effects are produced and the improvement promises to have an extensive introduction, as it may be employed by any artist with entire success.

The patentee states as follows in the specification:

"This invention consists in the employment, in combination with the surfaces of photogrophic prints, lithographic prints, woodcut prints, engravings, and all kinds of pictures, whether upon paper or other material, of a translucent sheet or film such as wax, upon which film the inks or pigments used in coloring or finishing the picture are laid. In carrying out my invention I take any ordinary print or picture, as for example a photographic print, and upon the face thereof I place a sheet of ordinary white wax, sufficiently thin to be so translucent that, when the wax is in close contact with the picture, the principal outlines thereof can be discerned through the wax. I then carefully press the wax film into close contact with the surface of the picture, either by hard pressure or by means of a roller, or by passing the picture through a roller press, or other suitable press. In order to apply the necessary pressure, I cover the surface of the wax with fine paper. The application of suitable pressure serves to harden and condense the wax, making an excellent surface for the reception of inks and colors.

"The translucent film of wax thus applied will adhere very closely to the surface of the picture, which is then to be finished up by laying upon the film any suitable inks or colors that may be desired for the finishing of the picture, such as oil colors, water colors, india ink, etc.

"One of the peculiar advantages of my improvement is that the harsher lines and defects of the picture are more or less covered or softened, while the general effects of the lights and shades are blended and improved. This renders the use of my invention specially advantageous in connection with miniature coloring, as the skilled artist is enabled to preserve completely the original likeness, and yet with a comparatively small expenditure of time to produce the most charming and exquisite effects by stippling and coloring.

"The facility with which the background of the picture may be altered, lightened when too dark by the application of white colors, or darkened with dark colors when too light, or otherwise artistically changed, will be obvious. Alterations and corrections in the picture, may also be readily effected. In case of accidental injury to the surface of the picture, it may be easily repaired and preserved. The border of the translucent film may be embossed with any suitable ornamental composition.

"In other examples, where the picture consists of a profile or other naked figure, the semi-translucent material, after being applied upon the surface of the picture, may be traced with a needle or pointed instrument around the form of the profile, and all of the film except that directly upon the profile may be removed and the edges of the film then leveled down to the background. In this way the film-covered portion of the picture when colored up and finished, will appear to stand out in relief forming a medallion picture of very beautiful appearance.

"In the general use of my improvement the artist is enabled to produce accurate, life-like colors and effects with a facility which results from no other process with which I am acquainted.

"The use of the film herein described, serves also to prevent the original picture from fading and preserve it from injury from moisture and atmospheric changes."

THE PHILOSOPHY OF THE OVEN.

Reported for the Scientific American.

The seventh lecture of the scientific course before the American Institute, delivered by Professor Horsford, on the above subject, at Steinway Hall, on the evening of January 6th, was one of the most practical yet delivered. We greatly regret that our want of space forbids us to give more than a brief abstract.

After announcing the points to which he wished to especially direct the attention of the audience, namely, the "History of the Oven" and "How to make good Bread," the lecturer dwelt briefly upon the importance of the subject. He asserted that although among inferior animals, types of almost every art which characterizes man's civilization, could be found, not one, even of the highest orders of monkeys—resembling man more closely than any other animal—attempts to increase the palatableness of his food by cooking.

The art of baking or roasting is a very old one, dating back to the earliest periods of history. The device for baking used by the aborigines of this country, was the very simple one now used at clam-bakes, consisting of a shallow hole in the ground, in which a fire was built, and a mass of embers accumulated to heat the stones. When the stones had been sufficiently heated, the embers were removed, the clams heaped in their place and covered with seaweed. The heat of the stones relaxed the muscles of the clams in contact with them, the shells parted, and water flowed out to be instantly converted into steam, which in its turn opened all the shells above, and subjected the fleshy parts to a temperature of 212°. The lowermost layer of clams was subjected to a heat which produced destructive distillation, giving rise to savory odors, which penetrating the mass above, communicated to the meat a racy flavor of the highest acceptability, as many of us are ready to testify. The oven in use in ancient Syria, of which Sarah on the plains of Mamre took advantage, when directed to quickly knead three measures of meal, and make cakes on the hearth for the entertainment of unexpected guests, we may conceive did not differ greatly from our aboriginal device, if we omit the seaweed. But there was also in use a jar-shaped cavity in the earth, cemented on the bottom and sides, in which a fire was built. When the walls were sufficiently heated, the embers were removed, and the dough, prepared by mixing crushed wheat and water, was plastered in thin layers on the sides. This yielded a sort of Graham wafer, a kind of wheaten hoecake, of the palatableness of which many of our soldiers during the late war can give testimony, and which was the unleavened bread of the ancients. The elevation of this hollow structure to a convenient hight above the surface of the ground, may be regarded as the second step in the development of the oven. This usually consisted of an irregular hemispheric cavity, made of clay or stone-brick, supported on a platform, having a door on one side for the introduction of fuel and the dough to be baked, and another lesser opening on the top for the escape of smoke. When the interior walls of this oven had been heated by the flame of dried fire-wood, the embers were removed, the dough placed upon the floor of the oven, and the chimney and door closed, leaving the dough to be baked by the radiant heat from the walls. This kind of oven was everywhere to be met with half a century ago outside the log-houses of our frontier settlements. As the dwelling-houses were improved the oven was uniformly given a place in the chimney stack, beside the kitchen fire. In considerable towns bakeries grew up, and large ovens on the same general plan as the smaller were constructed. The objectionable characteristics of this time-honored oven was this: from the moment the dough was introduced the oven began to cool. The oven with continuous heat we owe to Count Rumford. Benjamin Thompson (Count Rumford, by patent of the King of Bavaria), a native of Woburn, Mass., attained great distinction as an inventor in the applications of heat. He is best known as the founder of the Rumford professorship in Harvard University, as the Rumford medal of the American Academy, and as the chief agent in the founding of the Royal Institution of Great Britain. His oven was an iron cylinder, heated from without by a supply of hot air, which might be regulated. It may be regarded as the germ of the cooking-stove and range. He conceived the idea of accomplishing in confined space what previous to his time had only been attained before an open fire. He subjected the meat throughout to heat, not high enough to scorch the surface, until the interior pieces had experienced the requisite modification to render them acceptable to the taste, and then introduced air heated to a temperature that would promptly brown the surface, causing the destructive distillation which is essential to produce the savor of well roasted meats. The meats so prepared were considered not inferior to the best roast meats produced by slowly revolving them before an open fire, and required very much less fuel. The brick oven, especially designed for baking bread, has been greatly improved in the direction of economy of fuel and labor.

The lecturer next explained the Aerotherme, introduced about a quarter of a century ago in France, which surrounds the oven by trunks of heated air, maintaining, like the Rumford iron oven, a constant and regulated temperature, and explained several diagrams prepared to illustrate its operation. At the Paris Exhibition there were several mechanical bakeries in operation. One of them, a French device, had a series of open-work shelves, each of the shape of a sextant, attached at the junction of the radii to a vertical shaft, by means of which the shelves could be swung over a bed of coals or into heated space, and kept there till the bread or biscuit was baked, and then carried round to the point of commencement to be discharged. Another of American invention, had the shelves suspended in a huge open work cylinder, in which their horizontality could be maintained, while by the revolution of the wheel they could be carried over the bed of coals, baked and returned. The Vienna oven is an Aerotherme, to which two important additions are made; one to admit steam into the oven during the process, so as to maintain a moist atmosphere down to the last few minutes of the baking; and the other a separate fire, from which radiant heat, of great intensity, may be thrown into the oven and reflected from the smooth roof, to almost instantly redden a very thin crust. The cracker bakery is a highly heated trunk, through which an endless metallic apron is made to carry a constantly renewed supply of cracker dough. The baked crackers are as regularly discharged from one end of the trunk as the fresh crackers in dough are introduced at the other.

Another invention in this direction contemplates the baking of a sufficient amount of bread to supply a city from a single establishment, and is the work of a man whose name is familiar to you from eminent services in the art of war as well as in the arts of peace, Mr. Hiram Berdan. He conceived the idea of an oven which should produce all the loaves of uniform evenness and with a rapidity before unheard of. His apparatus may be described as consisting of two towers filled with heated air, in one of which was an elevator always slowly ascending, and in the other a similar contrivance always slowly descending. On these was arranged a series of platforms with a few inches between; each platform, or huge tray, containing a hundred loaves or more. As each platform attained the summit in one tower it was shot across to the other tower, in which it descended to the bottom and discharged itself. As soon as it was discharged it was shot across to the foot of the ascending tower and refilled with loaves of dough to renew its course. The time of ascending and descending was so arranged as to exactly complete the baking. The whole series of movements of the platform was automatic, and carried on by steam power. Several of these grand ovens—the mechanical bakeries—were constructed in our large cities, and promised at one time to revolutionize the system of city bread baking. Precisely why they did not succeed I do not know. Some of them were destroyed by fire, under circumstances which led the proprietors to think the fires were the work of incendiaries.

The lecturer next proceeded to define the ordinary processes of cooking, baking, roasting, broiling, toasting, frying, stewing and boiling as all processes of cooking. In what do they differ? In boiling, the article of food is subjected to a temperature not exceeding 212°, the boiling point of water. In frying, it is subjected to the temperature of boiling fat or oil, which may be 500° or 600°, the boiling point of the fat or oil employed. In baking, roasting, broiling, and toasting, the interior temperature rarely exceeds 212°, but the exterior temperature may be 400°, or 600°, or 800°. In these, destructive distillation yields hydro-carbons, which are agreeable to the palate, and which are allied in composition to oil of peppermint, cloves, pepper, rose-oil, etc. Of all the cereals wheat is best suited to the wants of man. It contains principles of nutrition admirably adapted to the human organism. One portion enters into the composition of the vital tissues, and another subserves the purposes of fuel in providing warmth and force. Health may be preserved upon a diet of bread alone. The grain can be preserved indefinitely long in sound condition, with but little care. When the grain is crushed as between the stones of a mill there results a reddish gray powder—the whole meal—which is made up of scales and dust. These two products may be separated by bolting, giving on the one hand bran, divided in England into several grades of toppings, pollard, etc., and in this country into connell, shorts, sprouts, coarse and fine middlings, etc., and on the other hand, fine flour. If the fine flour be intimately mixed with a small quantity of water it constitutes the elastic, somewhat tenacious, substance, with which we are familiar in the form of dough. If this dough be kneaded in a gentle stream of water, the water will become milky, and if the water be placed in a jar there settles out a white powder. If the washing be continued, at length the water will cease to be milky and we shall have remaining a tough, highly elastic body somewhat like India-rubber, known as gluten. The white powder, that has been separated is starch. The gluten has been separated by chemists into several bodies which have very nearly the same construction, but which differ from each other somewhat in properties. All of them contain nitrogen and phosphoric acid, and beside carbon, hydrogen, and oxygen. Starch contains only carbon, hydrogen, and oxygen Besides the gluten and starch, the wheat contains a little sugar and oil. The chemical properties of these two bodies—the gluten and starch—are in the highest degree unlike. An acid like vinegar or lactic acid (the acid of sour milk) will deprive the gluten of its elasticity and in time convert it into a fluid.

The lecturer here enumerated the different kinds of fermentation liable to take place in dough under different circumstances, and then proceeded to describe the production of brewer's yeast. When a mass of ground rye, or corn, or wheat, is brought with warm water and the addition of a small quantity of yeast to a lively fermentation, the froth is skimmed off and repeatedly washed in large volumes of cold water from which it settles out a fine white powder. This is the yeast plant of the distilleries. If the wheat, or rye, or corn was sound, the yeast plant will be suited to bread fermentation, but if it was sour or in any way defective, the yeast plant will carry the taint to the dough. The brewer's yeast is made with more care; crushed rye is mixed with malt meal and fermented. The malt, as you know, is made from barley which has been steeped in water, allowed to germinate to consume most of its gluten, and also to convert its starch into dextrine and sugar, and then roasted to arrest the germination. Of course, the mixture of rye and malt contain relatively less gluten and more gum and sugar than pure rye or wheat meal. The foam from this fermenting mass washed and pressed is largely made at Rotterdam and exported to England under the name of German barm. This substance is known to us, mixed with bran and dried, under the name of yeast-cakes. These forms of ferment have the advantage that they may be made comparatively pure—that is, composed of the yeast plants that will yield alcohol and carbonic acid. When mixed with a large quantity of boiled potatoes (chiefly starch) they will yield precisely what is wanted to puff the bread up, make it light, and impart to it a delicious aroma that leaves nothing to be desired. But to secure this result what must you be sure to do? As the acetic and putrid fermentations follow closely on the alcoholic, you cannot rely on your potato yeast as a source of leavening for more than a very few days. You must be prepared to renew it frequently. The dough must not be allowed to cool, but must be maintained at an even temperature of some 80° to 90° and when it has attained the requisite prorosity and before acetic fermentation sets in it must be placed in a hot oven. If neglected, so as to permit

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the formation of either acetic or lactic acid, the gluten will be liquefied more or less, its tenacity will be lost, and the bubbles will run together, producing a few large instead of numerous small pores, and the dough will be liable to collapse and become heavy and sodden. I assume that you have the genuine yeast plant, suited, with proper care, to the ultimate production of alcohol and carbonic acid, and these alone, but when you take into account what shocking compounds are sometimes produced as beer, or ale, or whisky, and the susceptibilities of ferment to the influences of temperature and time, you will readily understand that the pure yeast plant is rather ideal than actual. There is an amusing prejudice in some parts of our country, not wholly confined to the less informed portions of communities, on the subject of alcoholic fermentation in bread. In a report on bread, prepared a few years ago by a generally well-informed gentleman, who happened to be a clergyman of Massachusetts, for an annual agricultural festival, the chairman dwelt upon the duty of every young lady to know how to make good bread. It was quite easy. It required attention to only two or three particulars—there must be good flour, a hot oven, and the fermentation must be carefully watched. It must be stopped at the right point, by putting the bread in the oven, and the right point was just before any alcohol was produced. This recalls the advertisement of a baker in London, many years ago, who had heard for the first time that alcohol is a product of granary fermentation. He advertised that bread baked by him contained none of the alcohol produced in the ordinary process of fermented bread.

He was followed a few days later, by a rival who announced that he took no pains to remove from his bread the alcohol produced in the process of fermentation. (It is to be presumed that these establishments preceded the "United Metropolitan Hot Muffin and Crumpet Baking and Punctual Delivery Company.") The quantity of this important product, though small in the individual loaf, is in the aggregate, large. Liebig estimates the annual amount in all Germany at not less than 7,500,000 gallons per annum. You do not need to be reminded that with the philosophy of good yeast bread, however clear before you, the ideal loaf cannot be made without good flour. The proportion of this, unfortunately, is small. The wheat runs the gauntlet from the day it is lodged in the ground. If it escapes the birds and is permitted to germinate, the soil may be wanting in nourishment, or the winter frost may snap the tender roots and delay the vegetation in spring, or it may be deluged with rains or scorched and blanched with continuous sunshine and drought; or preyed upon by the weevil or hessian fly; or smitten with rust at the critical instant when the organic activities are at the highest; or caught by showers in the shock and "grown" in the sheaf; or not sufficiently dry when it goes to the market; or soured in the granary; or heated in grinding; or become sour, and lumpy, and musty in the barrel. After having escaped all these dangers it is dreadful to think of its being poisoned by putrid yeast, or overtaken by a warm dog-day atmosphere, which is fatal to the best of yeast, or forgotten when passing through the critical stages of fermentation and baking. It is not to be wondered at that science has been invoked to preserve to us this invaluable grain and conduct it through the changes that are to give us bread. Thenard, Bossengault, Dumas, Payen, Megemouries, and others in France, Liebig, Knapp, Krocker, Mitscherlich, and others in Germany, and Thomas, Hassal, Pereira, Danglish, Odling, and others in England have lent their aid. The best bread of Paris, Vienna, and London may be regarded as in some degree the fruit of this labor, though the larger share of the credit is due to the bakers and skillful housewives who have mastered the unwritten science and art that lie at the foundation of their success.

Professor Horsford next discussed at length the different chemicals which have been used in making bread, dwelling particularly upon the self-raising flour prepared by intimately mixing phosphoric acid, in combination with potassa and lime; or taking the acid phosphate of lime and adding chloride of potassium to the self-leavening flour, which besides furnishing the phosphate of potassa on the addition of water, sets free hydrochloric acid. The hydrochloric acid being more soluble, acts more promptly on the bicarbonate of soda, producing chloride of sodium (common salt) and sets free the carbonic acid to inflate the dough. Thus constituted, the self-raising flour has, in most respects, very nearly the nutritive value of normal wheat, without the inferior color, and the liability to rapidly sour of the whole wheaten meal.

An extract from a letter by Baron Liebig was read, asserting that the nutritive value of flour is increased ten per cent by Professor Horsford's phosphatic bread preparation.

The speaker next noticed the attempts of Bonssingault and others to ascertain the nature of stale bread and said that the stale crumb may be regarded as a framework of gluten coated with glassy dried starch, which is not readily dissolved by saliva. Of course when taken into the mouth, it requires time before it becomes flexible, and can be easily compressed to force out the fluids it takes up in the mouth by virtue of its capilliary action. But by heating, the water of hydration of the gluten is driven out, the starch which invests the gluten is moistened and rendered flexible, and the whole crumb recovering the sponge-like elasticity of fresh bread, yields its juices when masticated, and is palatable. To test this, I placed in a glass tube a quantity of gluten, and sealed it up. I then placed the end containing the gluten in warm water, and beheld a few moments later moisture condensed on the interior of the upper end of the tube, which was cool. On withdrawing the tube from the water, after a few hours, the film of moisture had disappeared. Water had been driven out from the gluten by heat, and had been reabsorbed on cooling. I then placed another quantity of gluten in the bottom of a tube, above it a tuft of cotton, and above the cotton a quantity of loose shavings of very thin glacial starch. Now I expected, that if moisture was given off from the gluten, it would penetrate to the space occupied by the shavings, half liquefy the starch, and make it adhesive, in this condition the starch shavings would be gummed fast to the glass, and it would no longer be possible to shake them about. The experiment realized my expectations. The solution, then of the question of the difference between stale and fresh bread is this: *The gluten is dehydrated* by heat *in freshening, and the water driven out, softens the dried starch which coats the gluten. Thus softened the crumb is more palatable. On cooling the water is withdrawn from the starch, which is rendered dry and stiff in consequence, and restored to the gluten; and the bread becomes stale.* There is another point which is regarded as quite mysterious. It is called *the pile of bread*, and is an evidence of excellence. It is a term familiar to bakers, though possibly not to all my audience. A loaf in which all the pile is good may be separated into strips somewhat like the husks that coat an ear of Indian corn, or the coats that invest an onion. How this should appear in a loaf produced from a body apparently so homogeneous as dough is thought very extraordinary. The explanation is simply this: where the gluten of the flour is unimpared by heat or souring, it retains its tenacity, even when greatly attenuated. When the dough is kneaded, it is repeatedly spread out and folded over upon itself, from the border toward the center. The surface is repeatedly dusted with flour, until these layers of flour at last, after long-continued kneading, are everywhere present in the loaf, separating thin sheets and strips of the fermented dough, each strip containing fibers of tenacious gluten. Now this fine flour, by the last act of the ferment, is carried into the mucous stage of fermentation. So that when the loaf is baked there are planes or surfaces of soft mucilage, planes of separation, threading the loaf in the direction from the bottom around the outside toward the center at the top. These permit the loaf to be stripped off somewhat as short pie-crust though separated into flakes.

You will ask how such good flour as such "piled" bread is made from, may be obtained. The question is not easily answered. But some general guiding principles may be recognized. Wheat should not be cut until it is absolutely ripe. A little may be lost in harvesting, but nothing like what may be lost by cutting it while any portion of the berry is liquid. The moist straw by its evaporation draws the fluids out of the berry, and lessens enormously its nutritive value. Cut ten days too early is equivalent to a loss in weight of scarcely less than one-fifth of the whole weight. With thoroughly ripe, well-filled grain there is little difficulty in preparing good flour. But we must select from the flour which the market affords. Good flour from fully ripe, dry grain but recently ground, will not contain lumps. These are due to souring which softens the gluten and sticks the flour together. Good flour will readily mix with water to form a uniform creamy batter. Good flour will yield, with a small amount of water, a tenacious, elastic, homogeneous dough. Good flour will not smell sour or musty, but will exhale a fresh, fruity aroma. It will, when pressed in the hand, retain the imprint of the fingers. The chief characteristics of the self-leavening flour is its uniform cellular texture. This is an essential condition of the healthful preparations of farinaceous food. It should be porous, to permit the ready imbibition of the fluids that serve in digestion. The self-leavening flour is the substratum upon which whatever is desirable may be erected. Mixed with water, or sour milk, and immediately baked in a hot oven, it gives plain bread. If the tins are small the result is biscuit. Increase the quantity of water, beat in an egg, and spread the paste on a hot plate, and the product is a griddle cake. Add molasses and ginger, and you have gingerbread. Stew the leavened mass with raisins and you have a pudding. Eggs, sugar, and flavoring extracts, give you a sponge cake. If there be a fancy for the faint, delicate aroma of hops in bread, replace a portion of the water with Scotch ale. If a rich reddish brown crust to the bread be desired, add a trace of sirup to the milk or water. Will you apply the self-leavening principle to other forms of farinaceous food, mingle the phosphoric acid and the bicarbonate of soda with the corn meal, or rice, or rye, or buckwheat, and the task is accomplished. With the self-leavening agent at command, little time and moderate skill are required to secure uniformly excellent results. Let me conclude by giving you special instructions for making good yeast bread, the philosophy of which, I will hope, will now be easy to comprehend. Have flour freshly ground, and not too finely bolted. Prepare the yeast as follows: Boil thoroughly with the skins on, in one quart of water, enough potatoes to make a quart of mashed potatoes. Peel the boiled potatoes and mash them to fineness; mix intimately with them one pint of flour, and stir the whole to an emulsion with the water in which the potatoes were boiled. Cool the product to about 80° (lukewarmness), and add half a pint of the best fresh baker's yeast, and a tablespoonful of brown sugar. Set aside the mixture at an even temperature of about 80°, till it works well, or is in active fermentation. Of this yeast take half a pint to a gallon (7 lb.) of flour, mixed with three pints of water, or two of water and one of milk, all at the temperature of about 80°, add a little salt, knead thoroughly and set aside to rise at the temperature mentioned. When it has risen to nearly the full volume for the dough divide it into loaves, knead again, set it aside at the temperature already named till it attains the full size of the loaf, and place in an oven heated to not less than 450°. Let the loaves of dough be smaller than the tins. Keep them covered with flat thin plates of stiff paper till the dough is fully raised and the heat carried up to and sometimes maintained throughout the loaf at 212°, to convert all the starch to the mucilaginous or emulsion form and destroy the ferment. Then remove the cover, and permit the browning to take place. If the loaves are large a higher temperature will be required. Seven pounds of flour will make eight loaves of 1¼ lb each when baked, or flour of 2½ lb each. Such yeast will keep a week in winter and from two to four days in summer. Bread made with it, in faithful obedience to these instructions, will be good.

The lecture was illustrated by various experiments, among which was the baking of a loaf of bread from the self-leavening flour. Although lengthy, it was listened to with interest and frequent applause.

A NEW REGISTER FOR BUSINESS MEN.

The whole business community, and especially the mercantile classes and bankers, will find the work of McKillop, Sprague & Co., advertised on another page, of vast importance to them.

We have examined the register, which is annually issued by this old established house, and are astonished with the possibility of rating the financial standing of so many business men and firms with such apparent correctness.

No village is so small, whose merchants, with however little trade or capital, do not find their names and postoffice address recorded in this register. Manufacturers who wish to send circulars advertising their business, cannot from any other source procure so correct a list of names as they will find in this volume. The occupation as well as name and address being given, renders it easy, for persons so desiring, to reach any special class of manufacturers or tradespeople, whether they reside in cities, towns, or villages.

Editorial Summary.

THE *American Builder* asserts that marble of a very fine quality and in large quantities has been found near Marshalltown, Iowa. In color and texture it bears striking resemblance to the celebrated Caen stone of Paris, and must therefore of necessity be found very useful for ornamental purposes. Like the Caen stone it hardens on exposure to the atmosphere. If, after thorough tests have been made, this new stone should prove good its claims to durability, we see no reason why it should not come into general use for the purposes to which it is so admirably adapted. The want of some such material has been long felt.

A MISTAKE OF FOUR MILLIONS.—A somewhat important error in our measurement of the distance of the sun from the earth has been discovered. It is now proved that we have been accustomed to over-estimate the distance by four millions of miles, and that instead of ninety-five millions the real figure is ninety-one. This discovery is credited to Mr. Stone of the Royal Observatory, at Greenwich, England. Is it not probable that the sun and earth are gradually drawing nearer to each other? There are some persons who profess to believe, that ultimately our earth will plunge into the orb of day and be consumed. We patiently await the result.

PROFESSOR P. C. SINDING, of this city, will issue, this month, the first part of a fine edition of "Thorwaldsen and his Works," with explanatory text and three hundred and sixty five copper-plate engravings. The whole series will consist of twenty numbers, five of which form a volume. The illustrations, from the burin of Mr. F. G. Unnevehr, will include a dozen fine engravings after specimens in the Copenhagen Gallery. Professor Sinding, a Dane by birth, proposes to make this a fitting memorial of his illustrious fellow-countryman.

THE UNDERGROUND RAILWAY.—The Underground Railway Company not having complied with the terms of their charter, which required that $3,000,000 should be subscribed by Jan. 1st, 1869, and $300,000 deposited with the State Controller as forfeit in case the road should not be completed, within a specified time, the charter becomes void. Doubtless the project will be revived in some form, but we greatly regret its failure at this time. The city needs such a road and must eventually have it.

CHICAGO seems to be in a suffering condition from rats. The *American Builder* relates a story of a man who had to fight his way with a pole against an army of rats opposing his progress up a stairway in that city, complains that the soil of Chicago is particularly adapted to promote their rapid multiplication, and adds that the man who will invent some plan of construction which shall render a building rat-proof, will confer an immeasurable boon on the community, and make a fortune for himself and his children's children.

A ST. LOUIS telegram says accidents have become frequent on the Iron Mountain Railroad since the change of gage, though no one has been killed yet. The cause alleged is that the inclination at the curves was not changed with the narrow gage, and the angle is such that the weight of the cars is thrown against the lower rail with such force as to tear it from the track. The road is to be releveled.

RINGS.—We hear a good deal said about "rings", "Tammany Rings," "Indian Rings," "Albany Rings," "Congressional Rings," etc. Something has lately been said about the "Patent Office Ring." In the absence of gold and silver, we are curious to know whether this patent ring is made of brass, copper, or tin? Any information upon this important subject will be thankfully received.

THE *Tribune* of January 6th, tells a correspondent that the year 1800 belongs to the 19th century. If so the year 100 must have belonged to the second century, and the first century must have consisted of 99 years. The first year of the 19th century was 1801. Where is the *Tribune's* arithmetic?

A new company is to be organized at Salem, Mass., with a capital of $300,000 to manufacture Bengal bagging.

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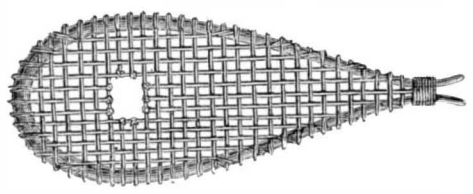
MECHANICAL SKILL OF SAVAGES.

The claim which we, as scientific and mechanical people make, of possessing all the scientific knowledge and mechanical skill belonging to the race, and that civilization alone confers a power over the forces and materials of nature, is hardly borne out by the facts. The ingenuity of some savage tribes in adapting themselves to circumstances and in providing means for overcoming natural obstacles is surprising, and would reflect credit on those who pride themselves upon their practical knowledge of mechanics and the laws governing the conditions of matter. Our cabinets of curiosities contain many specimens of skill made by untaught savages, the workmanship of which would be a source of pride to an educated mechanic. We do not refer merely to the results of expenditure of time and labor, but to the adaptability of the implement to the purpose desired. Some of these specimens are not only unique in appearance, but their form and mode of employment involve natural laws with which we are not fully acquainted. In many instances the savage can excel the civilized man even by the use of similar means. As illustrative of these remarks we introduce an engraving of a snow shoe, the invention of our North American Indians, and a boomerang, discovered first among the Australian savages.

The heavy snows which cover our continent above the 43d parallel of latitude for successive months in the year, would



prove a very serious impediment to foot travel but for the snow shoe. When the surface of the snow is frozen sufficiently to sustain the weight of a man this contrivance is not necessary, but when it lies like a deep bed of fleecy down, and offers as much resistance to the passage of the human body through it as an equal depth of water, the value of the snow shoe becomes apparent.

Its form, as generally made, is shown in the engraving. The rim is a piece of tough wood thickest in the middle and tapering to the ends. This is bent in the form shown, and the ends bound together with thongs of moose hide or deer skin. The frame is about three feet long, or less, to accommodate the size of the wearer. The space between the sides of the bow or frame is covered with a network of moose hide thongs interlaced like basket work. A space is generally left near the toe (the large part of the shoe) to receive the ball of the wearer's foot, although some prefer the network to cover the space. The toe or front of the foot alone is fastened to the shoe by straps, leaving the heel perfectly free, so that in walking the rear or tail of the shoe drags along on the snow. Only the toe of the shoe is raised in walking. One has an unpleasant sensation of being slipshod when first using the snow shoe. Only moccasins are adapted for snow shoes, as the ordinary boot or shoe is too rigid and unyielding. It might be supposed that the width of the shoe (ten to thirteen inches) would compel the wearer to spread his feet wide apart, but in walk-

ing the toe of the advancing shoe is raised slightly and slid over the one at rest, requiring no unnatural exercise or position of the legs or feet. A practiced walker can get over the snow at a very good speed; in proof of which it may be noted that on the 2d of January at a snow shoe race in Hamilton, C. W., five miles were made by the contestants in 31 minutes, 15 seconds, and 32 minutes, 11 seconds, respectively.

The boomerang is simply a curved piece of a hard heavy wood, with its edge on the concave side, like that of a scythe. The wood appears like ebony or very dark Honduras mahogany, and is highly polished. With this simple instrument the Australian savage can wound or kill his foe or game even when hidden by a rock or tree, by "shooting round a corner" like the negro's crooked gun. In the hands of an expert it may be used with great effect. Thrown from the hand it goes whirling on the same horizontal plane, at a hight of two feet from the ground, but on a sudden takes a turn, rising in a spiral plane and returning on a plane nearly parallel to that of its direct flight. Or it may be made to describe the arc of a horizontal circle and thus shoot round the corner. In the hands of the inexperienced, however, it is a dangerous plaything, coming, like curses, home to roost.

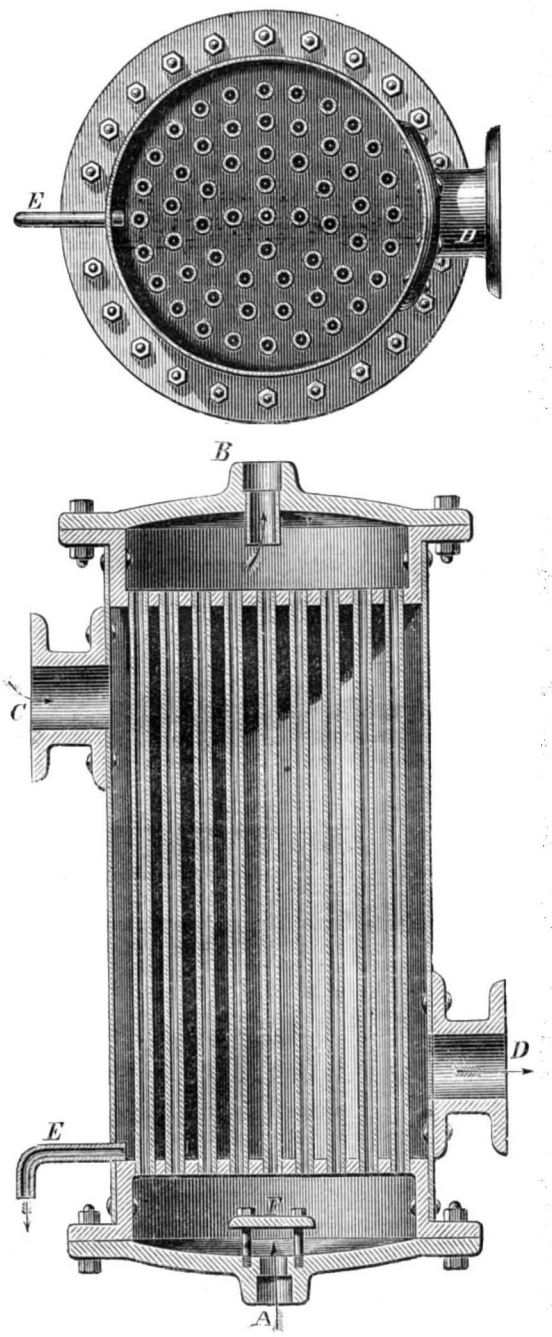
We are not aware that the philosophy of the boomerang has ever been comprehended, or its erratic behaviour explained. The "scaling" of flat stones or clam shells by boys seems to bear an analogy to the flight of the boomerang; but while the course of the stone or shell may be accounted for by the form of the missile and a mathematical formula deduced therefrom, the shape of the boomerang, when critically examined and gaged, affords no adequate basis for a philosophical conclusion.

A NEW SILVER ORE.—A new mineral called parisite, was discovered in the district of Mono, California, by Dr. Paris in 1865; it has recently been analysed by Professor Arent, and yields 6·12 per cent of oxide of silver.

ECONOMICAL AND SIMPLE HEATER FOR STEAM BOILERS.

The following communication with accompanying illustrations is from a practical engineer, who has frequently enriched our columns with the results of his experience, and whose name is sufficient guaranty of the value of his contributions:

Heaters for feed water for boilers of non-condensing engines are nothing new, but as a general rule they are imperfect in construction and of not sufficient capacity to permit a free exhaust; nor do they present sufficient surface to heat the water to the degree that they should, thereby producing "back pressure" and putting the water into the boiler at a far lower temperature than is due to that of the exhaust steam, which of course varies according to the work done previous to its being exhausted, or, perhaps, more properly speaking, expelled from the cylinder. This rarely falls below 212°, generally much above that, and there is no reason why we should not put our feed water into the boiler at very near the same temperature as that of the exhaust steam. Many devices for this purpose have been used. Heating the water by direct contact with the exhaust steam was formerly in general use:



it has this advantage, in case the water is impure—makes scale— a portion of the impurity will be left in the heater and pipe leading to the pump. I have known a heater of the capacity of 200 gallons in which more than half of its capacity was filled with a hard incrustation like limestone, and the pipe (2 inch) leading to the pump would become filled in three or four months to a degree that it would not supply the boiler. This was a serious objection, because to remove it was impossible without taking the pipe up and subjecting it to a heat sufficient to convert the limestone with which it was filled to commercial lime. Another objection to the above mode is that the feed water is heated before it is taken by the pump und the vapor constantly being given off from hot water, accumulating in the pump barrel, becoming compressed, and thereby leaving no room for the water on the rise of the plunger to follow, the pump fails to supply the wants of the boiler.

The true and only safe way, then, is to supply the pump with cold water and heat it between the pump and the boiler; by this means a regular supply can be given the pump, which, if the consumption of the steam is nearly regular, will keep the water in the boiler nearly at the same level —an important point for economy and safety.

To effect this the "Coil Heater" was devised, which is a coil of pipe say one inch in diameter placed in a vessel of cylindrical form, the water being forced through the coil, the exhaust steam admitted into the cylindrical vessel impinging the coil containing the cold water, consequently heating the water, within the coil to a degree corresponding to the temperature of the steam, the surface exposed, the quantity of water, and its temperature passing through in a given time. Now this would require for an engine of 45-horse power, about 171 feet of one inch pipe in a coil, the water from the pump would have to pass the entire length of the coil to reach the boiler, and of course, following the convolutions of the pipe, more friction would ensue than if the pipe was straight. Then, again: if the water should be impure, incrustation of necessity would follow, reducing the conducting power, increasing friction, until the aperture became too small and the result would be the breaking down of the pump or bursting of the coil. From the nature of the coil it cannot be cleared, but must be taken out and a new one put in at a great expense.

I present to your readers the tubular heater, which is not claimed as anything new, but I wish to show its superiority over the open or coil heater, both as regards economy of fuel, original cost, and facility of repairs. The accompanying engravings show a section and plan of a feed water heater that was made for the writer in the year 1846, and which has been and is now in extensive use in New England, where coal costs more than here.

By this, it will be seen that in case of incrustation, on removing the head, an instrument can be introduced to clean the tubes from scale or other deposits. In case of the failure of a tube or tubes from any cause they may be easily removed and others substituted, by any ordinary mechanic with facility without removing the heater from its place.

Another advantage it has, is that with one set of patterns a heater can be made that is adapted to engines from ten to three hundred horse power—more or less—the difference only being the extension of the length, the tubes and shell being made to any desirable length.

It is found that one square foot of tube surface exposed to the action of the exhaust steam is sufficient for each indicated horse power. This may be varied according to circumstances. If the engine works full stroke, with, say 60 lbs. steam without cutting off, the surface may be reduced. If cutting off very short, say at ¼, it should be increased, unless steam of a very high tension, say 100 lbs. or above, is carried. With the pump graduated to supply the boiler the temperature of the feed water will be found to be from 205° and upwards.

The engraving is intended to be on a scale of one inch to a foot.

The tube plates, flanges, and covers are of cast iron. The holes in the plates are reamed out smooth and slightly countersunk on the outside. The tubes are one inch outside diameter, made of copper, brass, or iron, fitted to the holes in the tube plates nicely, projecting at each end $\frac{3}{32}$ of an inch. A slightly tapered steel plug is driven in at each end, then the projecting ends are clinched down with a staking tool. When thus secured they are invariably tight and easily removed if required. The shell is made of boiler iron, say of $\frac{3}{16}$ thick

The vessel is placed upright. The water enters at the bottom at A, and is discharged at the top, B, passing through the tubes. The exhaust steam enters at the top nozzle, C, on the side, bathing the tubes which are filled with water, and is discharged at the side nozzle, D, at the bottom.

Now it will be seen that, from the diameter and length of the 57 pipes, with a pump sufficient to supply a 50-horse power boiler the water would be subjected to the action of the steam fully, giving ample time to heat it.

The small pipe, E, at the bottom on the left hand side is to take off the water that is made from the condensation of the steam. The short pipe, B, projects from the top cover downwards to leave a space above its open or lower end to act as an air chamber to relieve the shock caused by the action of the pump.

The circular plate, or disk, F, over the water entrance at the bottom is to deflect the water so that it may not pass in undue proportion through the center tubes.

F. W. BACON.
Consulting Engineer.
84 John street, New York.

NEW PUBLICATIONS.

ONWARD.

The first number of Mayne Reid's new magazine, "Onward," is one of the best illustrated and printed magazines that has found its way to our table this month. It purports to be a magazine for youths, and if the promise which this number gives is to be fulfilled in the future, the youths of this country have got much to be grateful for. Ourself, albeit we have found latterly some silver lines creeping in around our temples, and relieving the otherwise somewhat too vivid hue of our beard, wish to be counted as youthful, if such an intellectual treat is to be monthly set before the youths of the United States. In short, we are more than pleased with everything about it except the uncut leaves; but we hope Mr. Carleton, the publisher, will, in future, remember that there are some old youths in this land whose fingers are not so nimble as of yore, and with whom a magazine with leaves cut to hand finds much favor. We predict a brilliant career for "Onward."

THE AMERICAN BUILDER AND JOURNAL OF ARTS.

This new journal comes to us greatly improved and enlarged. Its illustrations are excellent, and its editorial articles have a fine flavor. We have already had the pleasure of welcoming the advent of this journal, as our readers will remember, and we consider it amply worth its subscription price, three dollars. It is published by Lakey & Adams, Chicago, Ill.

THE OLD WORLD IN ITS NEW FACE: IMPRESSIONS OF EUROPE IN 1867–1868. By Henry W. Bellows. 2 volumes. Cloth, $3·50.

We are indebted to the author, Rev. Dr. Bellows, for the above very entertaining and instructive volumes of European travel, the reading of which we have enjoyed with peculiar pleasure, greatly enhanced by the fact that during a part of the year 1867 it was our privilege to enjoy the society of Dr. Bellows and his family through Holland, Germany, and some portions of Switzerland. Dr. Bellows is an original thinker, a keen observer, and an accomplished writer, and there is a freshness and vigor about his observations which commend them to all who enjoy reading about foreign countries. The author's travels extended through Egypt, Syria, Palestine, Turkey, and Greece, and one of the most instructive features of the work is that which treats of the condition and prospects of heroic little Greece. Next to the enjoyment of the trip itself, we can recommend no better substitute than Dr. Bellow's admirable volumes, which can be obtained through any bookseller.

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TRAVELS AND ADVENTURES IN SOUTH AND CENTRAL AMERICA. Charles Scribner & Co,, 654 Broadway, N. Y.

A very interesting volume, from the pen of Don Ramon Paez, on the climate, products, and animals of South and Central America has just been published. The subjects are pleasantly treated by the author, whose home was formerly in Venezuela, and the book is handsomely illustrated with engravings of wild beasts, crocodiles, etc., which are indigenous to those tropical countries.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

RAILROAD CAR HEATER AND VENTILATOR.—Asa Weeks, Minneapolis, Minn.—The object of this invention is to provide an apparatus for warming and ventilating railway cars in winter, and cooling and ventilating them in summer; the apparatus being so constructed that it is cheap, convenient to manage, and economical in operation, and can be applied to a whole train without any difficulty arising from the coupling and uncoupling of the cars.

DETACHING BOATS.—Thomas H. Mortimer, Charleston, S. C.—This invention has for its object to provide a simple, cheap, and effective device, by which boats at sea can instantly be detached from the davit tackle when lowered into the water.

GATE.—S. S. Allen, Belvidere, N. Y.—This invention relates to improvements in gates, whereby it is designed to provide a convenient and reliable means for opening and closing the same, when riding either on horseback or in carriages, without the trouble and delay of dismounting.

DEVICE FOR CLEANING OIL WELLS.—Jacob Taylor, Petroleum Center, Pa.—This invention has for its object to produce a device by which the cracks and crevices of oil wells can be scraped open when they are clogged by paraffin and other impurities.

FIRE ARMS.—Peter Shuler, Morris, Ind.—This invention relates to a new and useful improvement in fire arms of that class which are commonly termed needle guns.

PISTON PACKING.—Francis A. Brown, Ithaca, N. Y.—This invention relates to a new and simple metallic packing for pistons, and it consists in a novel and improved mode of construction and arrangement, whereby a closely-fitting piston is obtained, and one which will not be liable to become affected by wear.

VEGETABLE SLICING MACHINE.—Samuel Markel, Roseburgh, Pa.—The object of this invention is to provide a machine for slicing up large quantities of vegetables, as cabbage, beets, turnips, and the like.

CORN PLANTER.—James S. Coen, Attica, Ind.—This invention relates to a new and improved machine for planting corn, and it consists in a peculiar construction of the frame of the machine and its working parts.

STEAM TRAP.—George H. Corliss, Providence, R. I.—The object of this invention is to effect an automatic escape for the products of condensation from steam, and other pipes or vessels, and at the same time prevent the escape of steam, vapor, or gas, from the pipes or vessel in which it is confined.

SMOKER'S COMPANION.—William H. Waite, New York city.—This invention has for its object to furnish a simple and convenient instrument for holding a cigar when smoked close, and also for use as a pipe stopper and for cleaning out the bowl of the pipe.

HORSE RAKE.—J. C. Stoddard, Worcester, Mass.—This invention relates to a new and improved hay rake, and is a modification of and an improvement upon a hay rake for which Letters Patent were granted September 11, 1860.

SOWING PULVERULENT MANURES.—Joseph L. Stegall, Thomasville, Ga.—This invention relates to a new and improved machine for sowing pulverulent manures, such as lime, plaster, ashes, guano, etc., etc. The object of the invention is to obtain a simple, efficient, and mechanical device for the purpose specified.

PRESSURE REGULATOR.—George H. Corliss, Providence, R. I.—This invention is for the purpose of effecting an automatic reduction of the pressure of steam, when it is to be used for heating, or where a higher pressure is raised in the boiler than is required for the purposes to which it is to be applied, and making such reduced pressure uniform.

ATOMIZING TUBES.—William K. Leach, Boston, Mass.—This invention relates to an improved method of constructing what is known as atomizing tubes, an apparatus employed in drawing up any medicated or other liquid from a suitable vessel, and diffusing the same in the air in the form of finely divided spray or atoms.

PULVERIZER.—Isaac N. Jennings, Danbury, Conn.—This invention relates to a new implement for pulverizing the soil, which can be used as an attachment to harrows or independently, as may be desired. The invention consists in applying to a horizontal beam or head a series of metal straps, which project from front and rear; those in front serving to hold down and break up loose lump, while those in rear project downward into the ground and pulverize the same. The lower front corner of the beam is protected by metal straps, and works on the ground so as to prepare the same with its weight, crushing the lumps and evening the ground before the back teeth commence to act.

IMPLEMENT FOR PULLING HOP POLES.—A. L. Hatch and W. A. Hatch, Loyd, Wis.—This invention consists of a lever or hand spike pivoted to the upright of a pedestal board or block with a joint permitting a double movement of the lever; to wit, the usual vibrating movement and a downward swinging of the lever. The lever is provided with a stout iron prong or tine affixed near the end of the same, and running out parallel to the short arm of the same, leaving a space between it and the said short arm suitable for receiving and cramping upon hop poles in the act of extracting them from the ground.

MOUNTING ARTIFICIAL TEETH.—William C. Michaelis, New York city.—This invention has for its object to improve the construction of lower sets of artificial teeth so as to make them stronger and better than when mounted in the ordinary manner, and at the same time less liable to move when used for masticating purposes.

CHURN.—James King, Succasunua, N. J.—This invention relates to a churn in which a square dasher is arranged in an oblong box in such a manner that, by revolving the said dasher the whole inner space of the churn will be swept by the dasher, and its contents well agitated, so that butter can be quickly made.

VEHICLE.—Charles De Damseaux, New York city.—This invention relates to a new manner of arranging the wheels of cars and wagons, and by connecting them with sliding rails, so that the rails will be automatically placed below the wheels as the vehicle progresses in either direction. The invention also consists in the use of segmental wheels arranged side by side, in such a manner that a certain number of segments serves to make up a whole wheel. In connection with these wheels are arranged sliding rails, which are at both their ends secured to weighted chains or ropes, and which lie on the ground to form the treading surfaces for the wheels.

HOT-AIR DRUM.—William Allchin, Newburgh, N. Y.—This invention relates to a new apparatus for heating air by the products of combustion that escape from a stove, furnace, oven, or range of suitable construction. The invention also consists in the use of a flat, rectangular drum, which is by interior partitions divided into three zig-zag channels, of which the central one serves to conduct the products of combustion to the chimney or flue while the outer ones are passages for air which, entering the drum at the lower end in a cold state, becomes heated by the hot plates and partitions, the latter having been heated by the smoke passing up between them.

PORTABLE ADJUSTABLE STILL-WATER DAM.—Samuel Lewis, Brooklyn, N. Y.—This invention relates to improvements in a portable adjustable still-water dam, and consists in an arrangement whereby the boat float or vessel bearing the machinery may be raised clear of the water and be anchored to the bottom of a stream by long timbers or spuds.

EARTH SCRAPER.—Nelson Peck, Jay, N. Y.—This invention has for its object to improve the construction of the improved scraper, patented by the same inventor, September 4th, 1866, and numbered 57,757, so as to simplify its construction, and make it more convenient and effective in use.

SUBAQUEDUS DRILLING APPARATUS.—Samuel Lewis, Brooklyn, N. Y.—This invention consists in apparatus, designed to simplify the operation of drilling rock under water.

TOBACCO PIPES.—G. Corey, Brooklyn, N. Y.—This invention consists in hanging the bowl of the pipe on pivots in a forked stem, so that it may revolve, if desired, and so that it will by its gravity hang in an upright position.

PISTON PACKING.—David Neahr, Fort Yuma, Cal.—This invention consists of metal packing rings, made in segments, one ring fitting into a chamber or recess in another ring, said segments being so placed together as that the joints of the segments of each ring are broken by the other ring; said segments held together by a coiled or spiral spring around the same, so placed upon a follower on a metallic coiled spring in the stuffing box as to be kept tight upon the seat, the same in the inside of cap or cover of the stuffing box, whereby the same is prevented from leaking steam around the piston or through the aperture in the cap.

RICE SOWING MACHINE.—T. D. Dotterer, Charleston, S. C.—The object of this invention is to provide a machine which will work close to the ditches or fences, and over the unequal ground, and otherwise perform the work in a better manner than machines now in use.

HORSE POWER.—Charles F. Gay, Albany, Oregon.—This invention has for its object to furnish an improved horse power, simple in construction, strong and durable, and which shall be so constructed as to greatly diminish the friction and increase the effective power of the machine.

PORTABLE FENCES.—P. Lambkin, St. Albans, Vt.—This invention has for its object to furnish an improved portable fence, so constructed that it may be durable, substantial, and effective, easily and quickly set up and taken down, and which may be folded or shut up into small compass for transportation.

GANG PLOW.—Z. T. Sweet, Eugene City, Oregon.—This invention relates to a new and improved gang plow of that class which are provided with a driver's seat and are commonly termed sulky plows.

CORN CUTTER AND SHOCKER.—Hiram Harris, Circleville, Ohio.—This invention has for its object to furnish a simple, convenient, and effective machine for cutting and shocking corn, by the use of which the time and labor usually required for these operations may be greatly diminished.

CORN PLANTER.—Wm. B. Goodwin, Kinmundy, Ill.—This invention has for its object to improve the construction of the parts of a corn planter, by which the dropping slides and the marker arms are operated, so as to make them more simple in construction, more effective in operation, and less liable to get out of order.

WINDOW SASH.—M. R. Perkins, Portsmouth, N. H., J. V. Bogert, New York city, and J. F. Lowell, Boston, Mass.—This invention has for its object to improve the construction of window sashes, so that they may be conveniently turned down inward for convenience in washing them, and which shall at the same time in no wise disfigure the window.

CORN SHELLER.—Jas. M. Hawley, Holton, Ind.—This invention has for its object to furnish an improved corn sheller, by means of which the corn may be removed from the cobs rapidly and entirely, whatever may be the size or shape of the ear, and which shall at the same time be simple in construction and easily operated.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, an Extra Charge will be made.

Wanted—An apparatus for the distillation of wood, in which the gas is converted into fuel. Capacity about one cord. Address Wm. Gurney, Clinton, La.

Manufacturers and machinists who want orders, read Boston Bulletin, whose reports of manufacturing news of the U. S., show who needs machinery, etc. Address Boston Bulletin. Terms $4 a year.

Tin scrap, of different sizes, up to pieces six inches long by three to four inches wide, for sale cheap. Apply to Manning, Bowman & Co., Middletown, Conn.

"Broughton's" lubricators for steam chests possess all the qualities requisite. They use either suet or oil; can be graduated at will, and are more simple, cleaner, more durable and efficient than any others; they cannot leak, and will pay for themselves in saving of oil in a few weeks. Send to Broughton & Moore, 41 Center st., N. Y., for circulars.

For sale at a bargain—A good second-hand steam engine, 30-horse power. Apply at once to P. & F. Corbin, New Britain, Conn.

Parties interested in propulsion, treated of on pages 2 and 44, Scientific American, may address F. R. Pike, 56 Cedar st., New York.

I will visit the principal cities throughout the U. S., beginning with New York, the 1st of March, with my one-wheeled velocipede, perfectly balanced drive wheel, from 4 to 6 feet in diameter, with an elastic wire, that will run over the roughest pavements with perfect ease. Speed from 15 to 20 miles per hour. Manufacturers interested. Patent pending through the Scientific American Agency. L. H. Soule, Mt. Morris, N. Y.

Wanted immediately—The address of all inventors and manufacturers at the Whitlock Exposition, 245 Broadway, New York.

For steam pumps and boiler feeders address Cope & Co., No. 118 East 2d.st., Cincinnati, Ohio.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Responsible and practical engineers pronounce the Tupper Grate Bar the best in use. Send for a pamphlet. L. B. Tupper, 120 West st., N.Y.

Iron.—W. D. McGowan, iron broker, 73 Water st., Pittsburgh, Pa.

For sale—100-horse beam engine. Also, milling and edging machines. E. Whitney, New Haven, Conn.

Millstone-dressing machine, simple, durable, and effective. Also, Glazier's diamonds, and a large assortment of "Carbon" of all sizes and shapes, for all mechanical purposes, always on hand. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

For sale cheap—one engine lathe, 5 feet swing, 20 feet bed, in perfect running order. Address D. Lane, Montpelier, Vt.

Get a fire extinguisher for your building. It may save it from destruction. Send to U. S. Fire Extinguisher Company, 8 Dey st., New York, for descriptive circular.

Wanted—Marbelizer of slate, marble, and iron mantles. Address Bissell & Co., Pittsburgh, Pa.

Water-power, with grist & saw mill, 90 miles from N.Y., for sale, good location for paper mill or manufactory. H. Stewart, Stroudsburg, Pa.

J. H. White, Newark, N. J., will make and introduce to the trade all descriptions of sheet and cast metal small wares, dies and tools for all kinds of cutting and stamping, patterns, etc., etc., for new and experimental work.

For descriptive circular of the best grate bar in use, address Hutchinson & Laurence, No. 8 Dey st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for Lithograph, etc.

N. C. Stiles' pat. punching and drop presses, Middletown, Ct.

Prang's American chromos for sale at all respectable art stores. Catalogues mailed free by L. Prang & Co., Boston.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 a year.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JANUARY 5., 1868.

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Patent Solicitors, No. **37** *Park Row, New York.*

85,503.—DIE FOR FORMING PLIER JOINTS.—George R. Andrus, East Berlin, Conn.

85,504.—MOTIVE POWER FOR SEWING MACHINES.—Samuel J. Baird, Staunton, Va.

85,505.—MOTIVE POWER FOR SEWING MACHINES.—Samuel J. Baird, Staunton, Va.

85,506.—FENCE.—Augustus T. Barnes, Seneca, N. Y.

85,507.—COFFIN.—John D. Bayliss, Alexandria, Va.

85,508.—WIND WHEEL.—John Beach, DeRuyter, N. Y.

85,509.—CULTIVATOR.—Nathan Carr, Jr., and John Carr, Monmouth, Ill.

85,510.—MEANS FOR REPAIRING BLOWING ENGINES.—Thomas Critchlow, Swatara township, Pa.

85,511.—BAG HOLDER.—Leonard Crofoot, Pavillion, N. Y.

85,512.—RAG-CUTTING MACHINE.—Adario E. Crosby, Glastenbury, Conn.

85,513.—RAG-CUTTING MACHINE.—Adario E. Crosby, Glastenbury, Conn.

85,514.—SKIPPING ROPE.—John R. Cross, Chicago, Ill. Antedated December 19, 1868.

85,515.—PRINTING PRESS.—H. B. Denny, Washington, D. C.

85,516.—CORN PLANTER.—T. Duncanson, Buford, Ohio.

85,517.—PUMP.—Daniel S. Evans, Brockway, Mich.

85,518.—CAR SPRING BOX.—J. W. Evans, New York city.

85,519.—IRON FOR CARRIAGE POLES.—Benjamin Foltz, Rockford, Ill.

85,520.—APPARATUS FOR MAKING WIRE OF SHEET METAL.—Thaddeus Fowler, Seymour, Conn.

85,521.—OIL CAN.—O. H. Gardner, Fulton, N. Y.

85,522.—NAIL MACHINE.—F. A. Gleason, Brooklyn, N. Y.

85,523.—BIRD CAGE.—Gottlob Gunther, New York city.

85,524.—SEED SOWER.—Thurston G. Hall, Hume, N. Y.

85,525.—RULING PEN.—Alfred Hathaway, Charlestown, Mass.

85,526.—MACHINE FOR WASHING SHAVINGS IN BREWERIES.—Frederick Hinckel, Albany, N. Y.

85,527.—VELOCIPEDE.—John H. Irwin, Philadelphia, Pa.

85,528.—DEVICE FOR FEEDING CENTRIFUGAL SUGAR-DRAINING MACHINES.—Alfred Kusenberg, Philadelphia, Pa.

85,529.—"COLD FIX" FOR LINING IRON CHILLS, MOLDS, PIG BEDS, ETC.—Henry A. Laughlin, Pittsburg, Pa.

85,530.—COMBINED PRESS AND STRAINER.—Joseph H. Littlefield, Cambridge, Mass.

85,531.—MACHINE FOR BENDING SHEET METAL.—William J. McLea, Leroy, N. Y.

85,532.—COTTON PICKER.—Albert Pettingill, East Livermore, Me.

85,533.—PLOWSHARE.—L. M. Reed, Troy, Ohio.

85,534.—SAP SPILE.—L. M. Reed, Troy, Ohio.

85,535.—BUTTON-HOLE FOR PAPER COLLARS.—William H. Robinson, Rochester, N. Y. Antedated December 22, 1868.

85,536.—STEAM ENGINE.—Horace Rockwell, Roanoke, Ind.

85,537.—EMERY WHEEL.—Addison M. Sawyer, Athol, Mass. Antedated December 26, 1868.

85,538.—POLISHING WHEEL.—Addison M. Sawyer, Athol, Mass. Antedated December 26, 1868.

85,539.—PLAYING TABLE.—Henry Seher, New York city.

85,540.—COFFEE POT.—Daniel M. Skinner, Sandwich Center, N. H.

85,541.—WHIFFLE TREE.—E. A. Smead, Tioga, N. Y.

85,542.—MACHINE FOR PRODUCING UNIFORM TWIST IN TABLE CUTLERY, SPOONS, ETC.—Egbert W. Sperry, Wolcottville, Conn.

85,543.—LOG-CANTING APPARATUS.—Benjamin R. Stevens, Grand Rapids, Mich.

85,544.—SHOOL DESK AND SEAT.—G. A. Stewart, Des Moines, Iowa.

85,545.—REAMING TOOL.—Edward Sullivan, Pittsburg, Pa. Antedated December 17, 1868.

85,546.—KNITTING MACHINE.—William A. Tangeman, Lockland, Ohio.

85,547.—POTATO PLANTER.—Joseph L. True, Benton, Me.

85,548.—PUMP.—James Underwood, Mason county, Ill.

85,549.—MANDREL FOR COILING SPRINGS.—Richard Vose and James Anderson, New York city.

85,550.—PAPER-RULING MACHINE.—J. J. Walser, Chicago, Ill.

85,551.—BUTTER WORKER, ETC.—James T. Whipple, Chicago, Ill.

85,552.—ENGINE LATHE.—A. E. Whitmore, Boston, Mass.

85,553.—COMBINED CALIPER, RULE, AND WIRE GAGE.—Frederick A. Adams, Shelburne Falls, Mass.

85,554.—HOT-AIR DRUM.—William Allchin, Newburg, N. Y.

85,555.—GATE.—S. S. Allen (assignor to himself and David Allen), Belvidere, N. Y.

85,556.—CARDING MACHINE.—Anthony A. Bennett and George Vine, Norwalk, Conn. Antedated December 28, 1868.

85,557.—DOG KENNEL OR HOUSE.—Samuel S. Bent, Portchester, N. Y.

85,558.—MACHINE FOR PIERCING STITCH HOLES.—Reuel Blackwood, Philadelphia, Pa. Antedated December 30, 1868.

85,559.—PIPE CONNECTION IN RAILROAD CAR HEATERS.—Marlin S. Bolt, Elmira N. Y.

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85,560.—BED LOUNGE.—Ernst Boese, Frederick Boese, and Abraham Neuberger, Chicago, Ill.
85,561.—STEAM ENGINE PISTON PACKING.—Francis A. Brown, Ithaca, N. Y.
85,562.—CLOTHES DRYER.—Andrew J. Chase, Boston, Mass.
85,563.—CORN PLANTER.—James S. Coen, Attica, Ind.
85,564.—HOT-AIR FURNACE.—Theodore E. Coles, Troy, Ohio.
85,565.—TOBACCO PIPE.—George Corey, Brooklyn, N. Y.
85,566.—STEAM PRESSURE REGULATOR.—George H. Corliss, Providence, R. I.
85,567.—STEAM TRAP.—George H. Corliss, Providence, R. I.
85,568.—TACK HAMMER.—John Crandell, Chicopee Falls, Mass., and Nathaniel P. Braman, Bridgeport, Conn.
85,569.—TRACK-LAYING VEHICLE.—Charles De Damseaux, New York City.
85,570.—COMBINED CULTIVATOR AND STALK-CUTTER.—E. F. Dehart, Swan Creek, Ill.
85,571.—EXHAUST DEVICE FOR LOCOMOTIVE ENGINES.—Joel Densmore, Sr., Erie, Pa.
85,572.—TOY STEAM ENGINE.—A. L. Dewey, Westfield, Mass.
85,573.—APPARATUS FOR UNLOADING GRAIN FROM WAGONS.—Charles S. Dole, Chicago, Ill.
85,574.—MACHINE FOR SOWING RICE.—T. D. Dotterer, Charleston, S. C.
85,575.—BELT PUNCH.—Mexworth D. Drake, Scituate, assignor to himself and Wm. E. Barret, Providence, R. I.
85,576.—MANUFACTURE OF GUNPOWDER.—Louis Henry Gustavus Ehrhardt, London, England assignor to George B. Upton, David D. Stackpole, and Samuel H. Gookin.
85,577.—PUMP.—I. N. Forrester and Jas. H. Ludington, Bridgeport, Conn.
85,578.—HORSE POWER.—Chas. F. Gay, Albany, Oregon.
85,579.—BUNG CUTTING MACHINE.—A. J. Gibson (assignor to Wm. C. Davis, and John W. Garrison), Cincinnati, Ohio.
85,580.—STEAM ENGINE GOVERNOR.—W. W. Gilbert, New York city.
85,581.—CORN PLANTER.—W. B. Goodwin, Kinmundy, Ill.
85,582.—EXPANDING HARROW.—I. J. Halsted, Springfield, Ill.
85,583.—STEAM ENGINE SLIDE VALVE.—Rob't Hardie, Albany, N. Y.
85,584.—MODE OF FINISHING PHOTOGRAPHS, ETC.—S. A. L. Hardinge, Brooklyn, N. Y.
85,585.—CORN HARVESTER.—Hiram Harris, Circleville, Ohio.
85,586.—SASH FASTENER.—Henry Haslam (assignor to himself and Walter Haslam), New Britain, Conn.
85,587.—HOP POLE PULLER.—A. L. Hatch, and W. A. Hatch, Loyd, Wis.
85,588.—BOTTLE STOPPER.—J. T. Haviland, San Francisco, Cal.
85,589.—MANUFACTURE OF DOLLS' HEADS.—George H. Hawkins, New York city.
85,590.—CORN SHELLER.—James M. Hawley, Holton, Ind.
85,591.—PULVERIZER.—Isaac N. Jennings, Danbury, Conn.
85,592.—MANUFACTURE OF CORN FLOUR.—Chas. Jones and William Standing, De Soto, Ill.
85,593.—CORN HUSKING MACHINE.—W. D. Jones, Hagaman's Mills, N. Y.
85,594.—CHURN.—James King, Succasunna, N. J.
85,595.—PORTABLE FENCE.—Philo Lambkin, St. Albans, Vt.
85,596.—ATOMIZING TUBE.—Wm. K. Leach, Boston, Mass.
85,597.—SUBAQUEOUS DRILLING MACHINE.—Samuel Lewis, Brooklyn, E. D., N. Y.
85,598.—ADJUSTABLE STILL WATER DAM.—Samuel Lewis, Brooklyn, E. D., N. Y.
85,599.—VEGETABLE SLICING MACHINE.—Samuel Markel, Roseburg Pa.
85,600.—MOUNTING FOR ARTIFICIAL TEETH.—W. C. Michaelis, New York city.
85,601.—PLOW ATTACHMENT.—Jas. W. Monical, Mooresville, Ind., assignor to himself and Adam Howe.
85,602.—GRAPPLE AND EXCAVATOR.—A. T. Morris, Bloomfield, N. J., assignor to himself and Jas. Cummings, New York city.
85,603.—COOKING STOVE.—M. J. Mosher, Troy, N. Y.
85,604.—RESERVOIR COOK STOVE.—M. J. Mosher, Troy, N. Y.
85,605.—MOLD FOR PUDDINGS.—Joseph Musgrove, East Newark, N. J.
85,606.—PACKING FOR STEAM-ENGINE PISTON RODS.—David Neahr, Fort Yuma, Cal.
85,607.—GATE.—H. S. Otis, Prescott, Wis., assignor to himself and John Green.
85,608.—DEVICE FOR TIGHTENING TIRES OF CARRIAGE WHEELS.—Harris Pearson and Harvey Pearson, Depeyster, N. Y.
85,609.—EARTH SCRAPER.—Nelson Peck, Jay, N. Y.
85,610.—GRAIN TOLLER.—C. R. Peden and B. A. Peden, Franklyn, Ky.
85,611.—WINDOW SASH.—M. R. Perkins, Portsmouth, N. H., J. V. Bogert, New York city, and J. F. Lowell, Boston, Mass.
85,612.—SNUB POSTS FOR RAFTS, FTC.—Evander Phillips, Edwin A. Dunham, and Aaron Winans, Albany, Ill. Antedated December 19, 1868.
85,613.—MANUFACTURE OF CHEWING TOBACCO.—Wm. Rinehart and David Rinehart, Pittsburg, Pa.
85,614.—FIRE PLACE HEATER.—Watson Sanford, Brooklyn, N. Y.
85,615.—MEAT CUTTER.—Chas. Schiller, Baltimore, Md.
85,516.—BREECH LOADING FIRE-ARM.—Peter Schuler, Morris, Ind.
85,617—BOLT FOR TRUNK, ETC.—Henry Simons, Phila'. Pa.
85,618.—TWINE HOLDER.—R. L. Smith, Wolcottville, Conn.
85,619.—MACHINE FOR SOWING PULVERULENT MANURES.—J. L. Stegall, Thomasville, Ga.
85,620.—HORSE RAKE.—J. C. Stoddard, Worcester, Mass. Antedated Dec. 26, 1868.
85,621.—GANG PLOW.—Z. T. Sweet, Eugene City, Oregon.
85,622.—OIL WELL CLEANER.—Jacob Taylor, Petroleum Centre, Pa.
85,623.—COMPOSITION TO BE USED IN THE MANUFACTURE OF SOAP.—R. P. Thomas, San Francisco, Cal.
85,624.—WRENCH.—Howard Tilden, Boston, Mass., assignor to Wm. D. Andrews, New York city.
85,625.—SHOE HEELING MACHINE.—C. H. Trask and Henry Eldridge, Lynn, Mass.
85,626.—TOBACCO STOPPER.—Wm. H. Waite, New York city, assignor to himself and J. R. Watson.
85,627.—HARVESTER-CUTTER HOLDER.—S. H. Wilson (assignor to himself and Cary S. Burtis), Auburn, N. Y.
85,628.—HARVESTER.—George W. N. Yost (assignor to Corry Machine Company), Corry, Pa.
85,629.—HUB TURNING MACHINE.—J. J. Zufelt and R. Craig, Sheboygan Falls, Wis.
85,630.—PADLOCK FOR MAIL BAGS, ETC.—P. A. Altmaier, Harrisburg, Pa.
85,631.—WHIFFLETREE.—S. H. Anderson, Hannibal, Mo.
85,632.—STEAM ENGINE GOVERNOR.—Wm. Ashby, Timber township, assignor to W. B. Caruthers, Indian Point, Ill.
85,633.—SEWING MACHINE.—M. M. Barnes, North Adams, Mass.
85,634.—ANIMAL TRAP.—Thomas Bingham, Stockport, Ohio.
85,635.—SCRAPER.—Isaac W. Boatman, Seven Mile, Ohio, assignor to himself and John M. Boatman, Peru, Ind.
85,636.—SUSPENDED GAS CIGAR-LIGHTER.—Dan'l F. Brandon, Chicago, Ill.
85,637.—GLASS MOLD.—Homer Brooke, New York city.
85,638.—TOY REPEATING PISTOL.—Edward Buckman and Alexander Buckman, East Greenbush, N. Y.
85,639.—MACHINE FOR PULVERIZING EARTH.—Wm. Martillous Bush, Greensburg, Ind.
85,640.—VELOCIPEDE.—Cornelius Callaghan, Boston, Mass.
85,641.—LAND ROLLER.—E. P. H. Capron, Springfield, Ohio.
85,642.—LUBRICATING COMPOUND FOR USE IN THE MANUFACTURE FIBROUS MATRIALS.—Chas. Clark, Dayton, Ky.
85,643.—BAG HOLDER.—Sam. P. Clemons, Dansville, N. Y.
85,644.—COMBINED LATCH AND LOCK.—Wm. H. Cloud, Fremont, Ohio.
85,645.—BREECH-LOADING FIRE-ARM.—J. Webster Cochran, New York city.
85,646.—SNAP.—Peter Dolan, Carbondale, Pa.
85,647.—EXPRESS MESSENGERS' SAFE.—Thos. Dolan, Albany, N. Y.
85,648.—PLANING MACHINE.—J. H. Draper, Mooresville, Ind.
85,649.—PICKPOCKET ALARM.—I. T. Dyer, Quincy, Ill.
85,650.—COMPOUND FOR CURE OF FOOT-ROT IN SHEEP.—Geo. Eckert, Charleston, Ohio.
85,651.—HAY RAKER AND LOADER.—Robert Elarton and E. A. Thomas, Hillsborough, Iowa.
85,652.—CORN PLANTER.—John Elbertson, Kirksville, Mo.
85,653.—MODE OF INSERTING ARTIFICIAL TEETH.—Edward B. Goodall, Portsmouth, N. H.
85,654.—FEATHER RENOVATOR.—Rufus H. Graves and Harvey L. Crandall, McGrawville, N. Y.
85,655.—APPARATUS FOR FEEDING STEAM GENERATORS.—Horace Griffin (assignor to himself, James A. Evans, and David Strong), New Haven, Conn.
85,656.—FLUID METER.—James Harris, Boston, Mass.
85,657.—STOMACH BITTERS.—Lemuel W. Harris (assignor to himself and Herman McGonegal), Chicago, Ill.
85,658.—HORSE HAY FORK.—A. J. Harrison, Cadiz, Ohio.
85,659.—MEDICAL COMPOUND.—George M. Hay, Americus, Ga., assignor to Harvey T. Litchfield, Boston, Mass.
85,660.—MOLASSES GATE.—John Hegarty, Jersey City, N. J.
85,661.—PUNCHING BOOTS, AND OTHER LEATHER STOCK.—Charles H. Helms, Poughkeepsie, N. Y.
85,662.—CULTIVATOR.—R. H. Henry, Monmouth, Ill.
85,663.—HYDROCARBON BURNER.—Samuel A. Hill, Oil City, assignor to himself and Charles F. Thumm and Oliver P. Scaife, Pittsburgh, Pa.
85,664.—STOVE-PIPE THIMBLE.—Charles Horel, Lincoln, Wis.
85,665.—MACHINE FOR CUTTING NAILS.—Cyrus D. Hunt, Fairhaven, Mass.
85,666.—ROOFING COMPOSITION.—Carleton B. Hutchins, Ann Arbor, Mich.
85,667.—COMPOSITION FOR ARTIFICIAL STONE.—Carleton B. Hutchins, Ann Arbor, Mich.
85,668.—PREPARATION OF COD LIVER AND OTHER OILS FOR MEDICINAL USE.—Thaddeus Hyatt, Atchison, Kansas.
85,669.—HORSE HAY FORK.—Jos. Jennings, Jacksonville, Ill.
85,670.—PULL IRON FOR HORSE CARS.—Allen S. Jimmerson, New York city, N. Y.
85,671.—AERO-GAS BURNER.—Wm. Jones, Chelsea, Mass.
85,672.—GUN LOCK.—John Kelsey, Richmond, Mo.
85,673.—RAILWAY RAIL.—Geo. W. King, Georgetown, D. C.
85,674.—FARM GATE.—D. L. Koons, Trimble, Ohio.
85,675.—CULTIVATOR.—George W. Kring, Fairbury, Ill.
85,676.—SHINGLE MACHINE.—Isaac I. Lancaster, Vancouver, W. T.
86,677.—LAMP CHIMNEY.—J. W. Larimore, Chicago, Ill. Antedated December 26, 1868.
85,678.—COOKING STOVE.—D. S. Leavitt, Grand Rapids, Mich.
85,679.—WASHING MACHINE AND BOILER COMBINED.—Henry T. Lee, Jersey City, N. J.
85,680.—SHIFTING CARRIAGE TOP.—Geo. R. Lucas (assignor to himself and H. W. Shepard), Mannsville, N. Y.
85,681.—BOOT.—Lysander O. Makepeace (assignor to L. B. Frazer and C. F. Coffin), Lynn, Mass.
85,682.—MACHINE FOR MAKING SEWING-MACHINE NEEDLES.—F. W. Mallet (assignor to himself and and George Cook), New Haven, Conn.
85,683.—WATER WHEEL.—E. W. McGuire, Eaton, Ohio.
85,684.—ELEVATED RAILWAY.—Richard Montgomery, New York city.
85,685.—BOAT-DETACHING APPARATUS.—Thomas H. Mortimer, Charleston, S. C.
85,686.—HORSE HAY FORK.—David Morton, Mount Vernon, Ohio.
85,687.—ROOFING MATERIAL.—John Munn, Camden, N. J.
85,688.—STEAM BOILER FURNACE.—J. L. Paige, Rochester, N. Y.
85,689.—HORSE SHOE.—George A. Parker, Westford, Mass.
85,690.—CARPET STRETCHER.—Samuel Pennock, Geneva, Ill.
85,691.—SNOW PLOW.—William A. Plantz, Iowa Falls, Iowa.
85,692.—RAILROAD TICKET.—W. E. Prall, Washington, D. C.
85,693.—CAR WHEEL FOR RAILWAYS.—John Raddin, Lynn, Mass.
85,694.—SAW BUCKLE AND FRAME.—J. Reilly, Baltimore, Md.
85,695.—CURTAIN FIXTURE.—C. J. Roberts, Chicago, Ill.
85,696.—PLOW.—Louis Ronat, Carondelet, Mo.
85,697.—LAMP BURNER.—John F. Sanford, Keokuk, Iowa.
85,698.—VAPOR BURNER.—Herman S. Saroni, Baltimore, Md.
85,699.—PITCHFORK.—Rensselaer Schuyler and William Crowninshield, Seneca Falls, N. Y.
85,700.—MACHINE FOR SEPARATING AND CONCENTRATING MAGNETIC AND OTHER ORES.—Edward L. Seymour, New York, N. Y.
85,701.—FURNACE FOR PRODUCING STEEL AND OTHER METALS.—Edward L. Seymour, New York city.
85,702.—HORSE HAY FORK.—Roscoe S. Sheldon, Chicago, Ill.
85,703.—PILE DRIVER.—J. J. Simons, East St. Louis, Ill.
85,704.—TOY GUN.—George H. Snow and George H. Coe, New Haven, Conn.
85,705.—EXTRACTING SPIRITS OF TURPENTINE FROM PINE WOOD.—James D. Stanley (assignor to himself and Thomas W. Wheeler), Wilmington, N. C.
85,706.—DRY MEASURE.—John H. Teahl, Eberly's Mills, Pa.
85,707.—HUSKING GLOVE.—J. H. Titus, Independence, Iowa.
85,708.—PARLLEL RULER.—F. A. Traut, New Britain, Conn.
85,709.—COMBINED WHEELBARROW AND CULTIVATOR.—Lewis Trafftz and George H. Shimpert, Pinckneyville, Ill.
85,710.—FENCE.—Mynard I. Turck, Schodack, N. Y.
85,711.—SEED PLANTER.—Stephen B. Ward, Auburn, Ind.
85,712.—RAILROAD CAR HEATER.—Asa Weeks, Minneapolis, Minn.
85,713.—COMPOSITION FOR ARTIFICIAL STONE.—Edward Westermayr, Chicago, Ill.
85,714.—OINTMENT.—Daniel Wigg, Hyde Park, N. Y.
85,715.—WAGON BRAKE.—Lewis Wolf (assignor to himself and T. E. C. Brinley), Louisville, Ky.
85,716.—BEE HIVE.—A. T. Wright, New Vienna, Ohio.
85,717.—FAUCET.—Martin Zimmerman, Earl Township, Pa.
85,718.—STEAM MOTOR.—Hugh Crumlisk, Keokuk, Iowa.
85,719.—MANUFACTURE OF ICE, AND THE REFRIGERATING OF AIR, LIQUIDS, ETC.—Charles Tellier, Passy, near Paris, France, assignor to Leopold Bouvier, St. Louis, Mo.
85,720.—RAILWAY CAR.—P. H. Watson, Ashtabula, Ohio.

REISSUES.

84,800.—HAY SPREADER.—Dated December 8, 1868; reissue 3,250.—Thomas C. Craven, Albany, N. Y.
41,929.—BOLT-MAKING MACHINE.—Dated March 15, 1864; reissue 3,251.—William J. Lewis, Pittsburgh, Pa.
31,734.—BUILDING FOR PRESERVING FRUITS AND OTHER SUBSTANCES.—Dated March 19, 1861; reissue 3,252.—Benjamin Markley Nyce, Cleveland, Ohio.
59,921.—STAIR ROD.—Dated November 20, 1866; reissue 3,253. William T. Mesereau, Newark, N. J.
49,922.—SLEEPING CAR.—Dated September 19, 1865; reissue 2,862, dated February 11, 1864; reissue 3,254.—George M. Pullman, Chicago, Ill., assignee, by mense assignments, of himself and Ben Field.
21,698.—HORSE RAKE.—Dated October 5, 1858; reissue 3,255.—Adam R. Reese, assignee, by mense assignments, of Mathias Raezer, Phillipsburg, N. J.
31,035.—TEA-KETTLE.—Dated January 1, 1861; reissue 2,122, dated December 5, 1865; reissue 3,256.—Division No. 1.—Ezra Ripley, Troy, N. Y.
31,035.—TEA-KETTLE.—Dated January 1, 1861; reissue 2,122, dated December 5, 1865; reissue 3,257.—Division No. 2.—Ezra Ripley, Troy, N. Y.
75,809.—PROCESS OF REMOVING TIN FROM SHEET METAL.—Dated March 24, 1868; reissue 3,258.—D. B. Sturdevant and H. B. Harmon, Clifton Springs, N. Y.

DESIGNS.

3,304.—STOVE.—Harrison Eaton, Amherst, N. H.
3,305.—CARPET PATTERN.—Israel Foster, Philadelphia, Pa.
3,306.—TRADE MARK.—Jacob Getz, Buffalo, N. Y.
3,307 to 3,314.—SHELF BRACKET.—Wm. Gorman (assignor to Sargent & Company), New Haven, Conn. Eight Patents.
3,315.—SPOON OR FORK HANDLE.—Henry Hebbard, New York city, N. Y.
2,316.—CARPET PATTERN.—Elemir J. Ney (assignor to Lowell Manufacturing Company), Lowell, Mass.
3,317.—STOVE.—John B. Nichels, Bangor, Me.
3,318.—SHELF BRACKET.—J. E. Parker, West Meriden, Conn.
3,319.—TAZZA FOR HOLDING CAKE.—William Parkin (assignor to Reed and Barton), Taunton, Mass.
3,320.—TEA SERVICE.—William Parkin (assignor to Reed and Barton), Taunton, Mass.
3,321.—ORNAMENT OF A HAT OR CAP.—John Sealy, Jr., Newark, N. J.
3,322.—ORNAMENT OF A HAT.—J. Sealy, Jr., Newark, N. J.
3,323.—ORNAMENT FOR A HAT OR CAP.—J. Sealy, Jr., Newark, N. J.
3,324.—BASE AND TOP OF A STOVE.—N. S. Vedder, Troy, N. Y.
3,325.—PLATES OF A STOVE.—N. S. Vedder, Troy, N. Y.
3,326 and 3,327.—PLATES OF A STOVE.—N. S. Vedder, Troy, and Tobias S. Heister, Lansingburgh, N. Y., assignors to N. S. Vedder Two Patents.
3,328 and 3,329.—PLATES OF A COOK'S STOVE.—N. S. Vedder, Troy, and Tobias S. Hester, Lansingburgh, N. Y., assignors to N. S. Vedder. Two Patents.
3,330.—DOORS OF A STOVE.—N. S. Vedder, Troy, and Tobias S. Hester, Lansingburgh, N. Y., assignors to N. S. Vedder.
3,331.—BASE AND TOP OF A STOVE.—N. S. Vedder and Francis Ritchie, Troy, N. Y., assignors to N. S. Vedder.
3,332.—PLATES OF A STOVE.—N. S. Vedder and Francis Ritchie, Troy, N. Y., assignors to N. S. Vedder.
3,333.—SLEEVE BUTTON.—Wm. H. Wilson, Providence, R. I.

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Washington, D. C., Dec. 31st, 1868.
Jeremiah Stever, of Bristol, Conn., having petitioned for the extension of a patent granted him on the 1st day of May, 1855, reissued the 11th day of October, 1859, and again reissued the 2d day of July, 1861, for an improvement in Machines for Burnishing Metals, it is ordered that said petition be heard at this office on the 5th day of March next.
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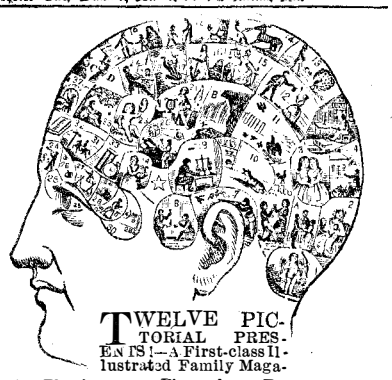

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Washington, D. C., Jan. 2d, 1869.
Rollin White, of Lowell, Mass., having petitioned for the extension of a patent granted him on the 3d day April, 1855, for an improvement in Repeating Fire-arms, it is ordered that said petition be heard at this office on the 2d day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 2, 1869.
Rollin White, of Lowell, Mass., having petitioned for the extension of a patent granted him on the 3d day of April, 1855, for an improvement in Breech-loading Fire-Arms, it is ordered that said petition be heard at this office on the 2d day of March next.
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ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 4, 1869.
James Emerson, of Lowell, Mass., having petitioned for the extension of a patent granted him on the 17th day of April, 1855, for an improvement in Ships' Windlasses, it is ordered that said petition be heard at this office on the 25th day of March next.
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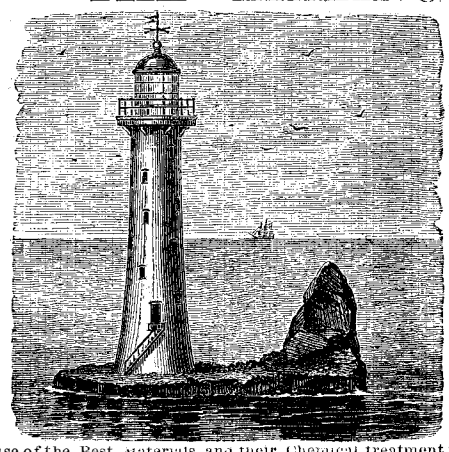

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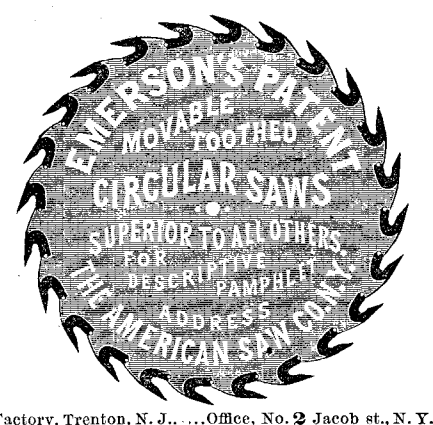

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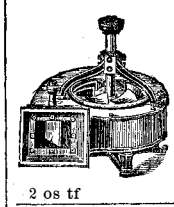

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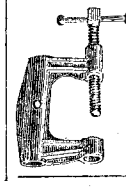

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